CR9, CP9, CT9

Celeron® M / Pentium® M
6U CompactPCI® SBC with Hot Swap

Hardware User's Manual
Edition 2.6

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CR9, CP9, CT9 Hardware User's Manual

This manual applies to the CR9, CP9, CT9 Celeron® M/Pentium® M PC/AT Compatible 6U CompactPCI® Single Board Computer hardware revision 2.0 and above, until superseded.

Rev /ID	Date	Chapter	Comments
0.0	24. Nov. 2003	All	First release
0.1 MF	23. Dec. 2003	Footer	Title changed
		I/O Connector J7003, J7004, and J7005	J7005: RS422/485 interface names added to COM2
		Environment Conditions	Table corrected
		All	Minor typos corrected and formatting changed
0.2 MF	26. Jan. 2004	PMC1 Connectors P6201, P6202, and P6203	Compliant to VITA 32-2003
		PMC2 Connectors P7201, P7202	Compliant to VITA 32-2003
1.0 PS	1. July 2004	Placement Plans	Updated to board revision V1.x
		Enter Setup	Press DEL when LED goes green
		Specifications	Maximum external battery voltage corrected
		Doc-layout	Heading styles renamed to standard
		Specifications	Battery external input and life time corrected
		CTM12	6U x 4HE/HP transition module
		Temp. sensors	description of both LM75 added
		External Battery	Hints for operating without onboard battery
		Style table	Speaker is mounted for R-, 6-Style
		Feature list	Pentium M 1.8 GHz and Celeron M 1.3 GHz added
		Specifications	Operating thermal data and notes updated
		Specifications	Supply Voltage Ranges added

		Placement Plans	Updated to board revision V2.x
		Footer	Updated to correct manual revision
		Ethernet Interface .	LED colors were mixed up between front panel and transition module CTM12
		PMC interface .	With board revision V2 and higher PMC slot 1 is PCI-X capable with 66/100/133 MHz
		Various	Typos corrected with P700x for the CPCI connectors
		Specification	Isolation voltage info added
2.0 PS	19. Oct. 2004	Hot Swap	Info about used pre-charge resistors added
		External Battery Input	More Hints added about working with battery less boards and storing Setup information then
		Specification	Power consumption section updated
		Transition module CTM12	P7700/P7701 Power input/output clarified, fused and unfused +5 V corrected
		SMBus devices	SMBus address of P64H2 updated
		External SMBus .	External Access to onboard SMBus can only be done via the IPMI controller
		Various	Typos corrected and improved
		PMC1 Connector	IDSEL lines corrected, EREADY removed
		App. B PMC	Table max. current adjusted for Cx9
		DVI	Max. resolution is limited to 1024x768
		External Manuals	Referencing names corrected
		Getting Started	Content of Application Note added into the manual
2.1 PS	16. Dec. 2004	Transition module Video connectors	Never use two display devices connected to the rear of the Cx9. You have to use one front, one rear.
		Specification	Height section added
		Resources, Function Blocks	APIC controller section with short description added, more Info with ICH4 datasheet
		Function Blocks	Watchdog section updated
		Serial ports	RS485 drivers are enabled with DTR signal
		Function Blocks	Processor section added
2.2 PS	Not final	GPIO	Corrected to be on J7004
2.3 HHS	29. Aug. 2005	All chapters	Cosmetic changes Boiler plates Technical corrections Height and P1801 corrections check layout
2.4 MF	11. May 2006	All chapters	Minor Cosmetic changes
		Legal Information	Change China address
		Page 23, 62, 63, 95	Add info on ATI Radeon graphics
2.5 HHS, MF	29. June 2006	Page 22	Reference to LSI Logic SCSI BIOS deleted
		Page 30	Requirement for +3.3 V added
		Table 24	VxWorks and Linux added

		Page 90	Figure renamed
		Page 69	RoHS compliance statement added
2.6 HHS, MF	22. May 2007	All	Cosmetic changes
		Support	Updated list of web site addresses
		Title	Change title, header and footer
		Table 28	Power Consumption for Celeron M 1.0 GHz and Pentium M 1.4 GHz added
		Figure 18	Temperature Curve updated for new processors
		CTM12	Correct pins on P2000
		Page 7	Insert Waste Disposal (WEEE) info
		Chap. 2 & 3	Update
		Chap. 8, Specific.	Insert note on electrical clearance
		Chap. 3	Correct configuration paragraph
		Environment Conditions	Correct storage temperature values & styles (non-RoHS)
		Chap. 1, Chap. 7	Insert info about EIDE/PATA transfer speed limits change primary/secondary on EIDE
		Chap. 5	Replace front panel drawings
		Intro	Insert CE conformance text

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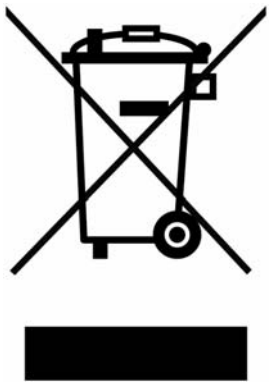
The mark or symbol on any electrical or electronic product shows that this product may not be disposed off in a trash bin. Such goods have to be returned to the original vendor or to a properly authorized collection point.



Electric waste disposal symbol with black bar as explained below

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For contact and other information (service, warranty, support etc.) see address list in chapter: ‘Support, Service’.

Welcome

The CR9, CP9, CT9 CompactPCI Single Board Computer is a fully IBM-AT compatible stand-alone PC equipped with numerous functions and add-on features on a minimized board size. This technical manual is designed to provide information regarding the general use and application of the CR9, CP9, CT9 CompactPCI Single Board Computer, as well as detail the hardware design. Software methods and programming information are also provided.

Chapter 1 gives a brief overview of the functions, features and devices of the CR9, CP9 and CT9.
Chapter 2 and 3 illustrate unpacking and installation procedures.
Chapter 4 describes how to get started
Chapter 5 describes all onboard and panel interfaces with pin assignments.
Chapter 6 contains notes on system resources.
Chapter 7 lists details of the function blocks.
Chapter 7 describes electrical and environmental specifications.

A number of expansion and add-on products are available for the CR9, CP9 and CT9. The CTM12 transition module and the PMC module are described in appendices to this manual. Please observe all safety instructions when handling SBS products as outlined in the unpacking and installation chapters.

The following documents also cover items relevant to the CR9, CP9 and CT9 CompactPCI Single Board Computer. All documents are included as files on the Technical Product Information CD-ROM.

- CR9, CT9, CP9, VR9, VP9 User's Manual for AMIBIOS8 Setup
- CR9, CT9, CP9, VR9, VP9 Board Specific Hardware Programmer's Manual
- AMIBIOS8 Check Point and Beep Code List
- AMIBIOS8 Error Messages
- Intelligent Platform Management Interface for CT9 User's Manual

Typographic Conventions

This manual uses the following notation conventions:

- *Italics* (sometimes additional in *blue* color) emphasize words in text or documentation or chapter titles or web addresses if underlined.
- Hexadecimal values (base 16) are represented as digits followed by "h", for example: 0C**h**.

- Hexadecimal values (base 16) are represented as digits preceded by “H”, for example: **H**0C.
- Hexadecimal values (base 16) are represented as digits preceded by “$”, for example: **$**0C.
- Binary values (base 2) are represented as digits followed by “b”, for example 01**b**
- The use of a “#” (hash) suffix to a signal name indicates an active low signal. The signal is either true when it is at a logic zero level (voltage close to 0 V) or the signal initiates actions on a high-to-low transition.
- The use of a “\” (backslash) prefix to a signal name indicates an active low signal. The signal is either true when it is at a logic zero level (voltage close to 0 V) or the signal initiates actions on a high-to-low transition.
- Text in Courier font indicates a command entry or output from an SBS embedded PC product using the built-in character set.
- Notes, warning symbols and cautions call attention to essential information.

Product Properties

Certification

The product or products described in this technical manual cannot be operated by themselves. They are components for integration into operational systems or add-ons to such systems. The products have been designed to meet relevant regulatory standards like FCC and CE. As mandated by these standards conformance to these standards can only be certified for complete operational systems. This has to be done by the end-user or by the systems integrator in their operational systems. SBS Technologies have tested some products in their own systems. Upon request information is available which products have been tested and about the specific environment under which SBS has tested these components.

Altitude

Altitude, air pressure and ambient temperature influence the thermal operation of the components described in this manual. They have been developed and tested at about 500 m (1650 ft.) above sea level at a typical ambient temperature of 20 °C (68 °F). Because of only marginal variations within a limited range of altitudes these products operate as specified within altitudes from sea level to 1000 m (3300 ft.). SBS Technologies can assist the user of these components in planning operation outside this altitude range upon request.

Options

This manual describes the basic product plus all options. Your product may not have all options implemented. Please verify with your purchase contract which options are implemented. Descriptions of options which are not implemented obviously do not apply to your product.

Support, Service and Warranty

The manufacturer grants the original purchaser of SBS products a warranty of 24 months from the date of delivery. For details regarding this warranty refer to Terms & Conditions of the initial sale.

Please see chapter ‘Support, Service, and Warranty Information’ for further details on repairs and product support.

For support on the web and product information, visit our website at http://www.sbs.com

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CHAPTER 1 Introduction

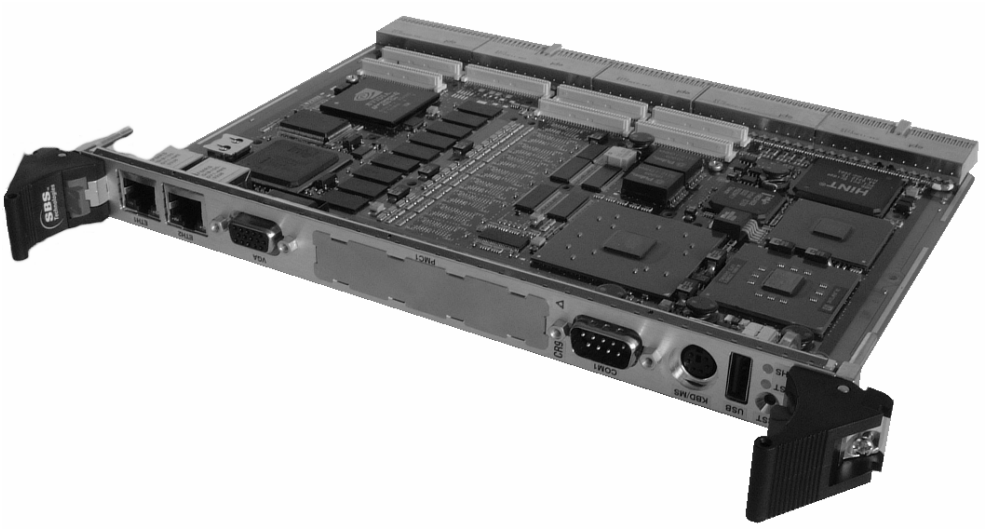

Figure 1: Sample picture of Cx9 board

Chapter Scope

This chapter describes features, capabilities and compatibility of the CR9, CP9 and CT9 CompactPCI Single Board Computer. All three boards are based on the same PCB design. These three products will be referred to in this manual as the CX9 family. Any further specification in this document referring to Cx9 can be applied to CR9, CP9 and CT9 unless otherwise noted.

Board Design

The Cx9 is a fully IBM-AT compatible stand-alone PC. It is equipped with many functions a conventional Personal Computer can only offer with several add-on cards. Extension boards can be connected via the CPCI interface. The minimized board size and the large number of interfaces and functions allow

the Cx9 to be used in many applications. See the following block diagram for the board design.

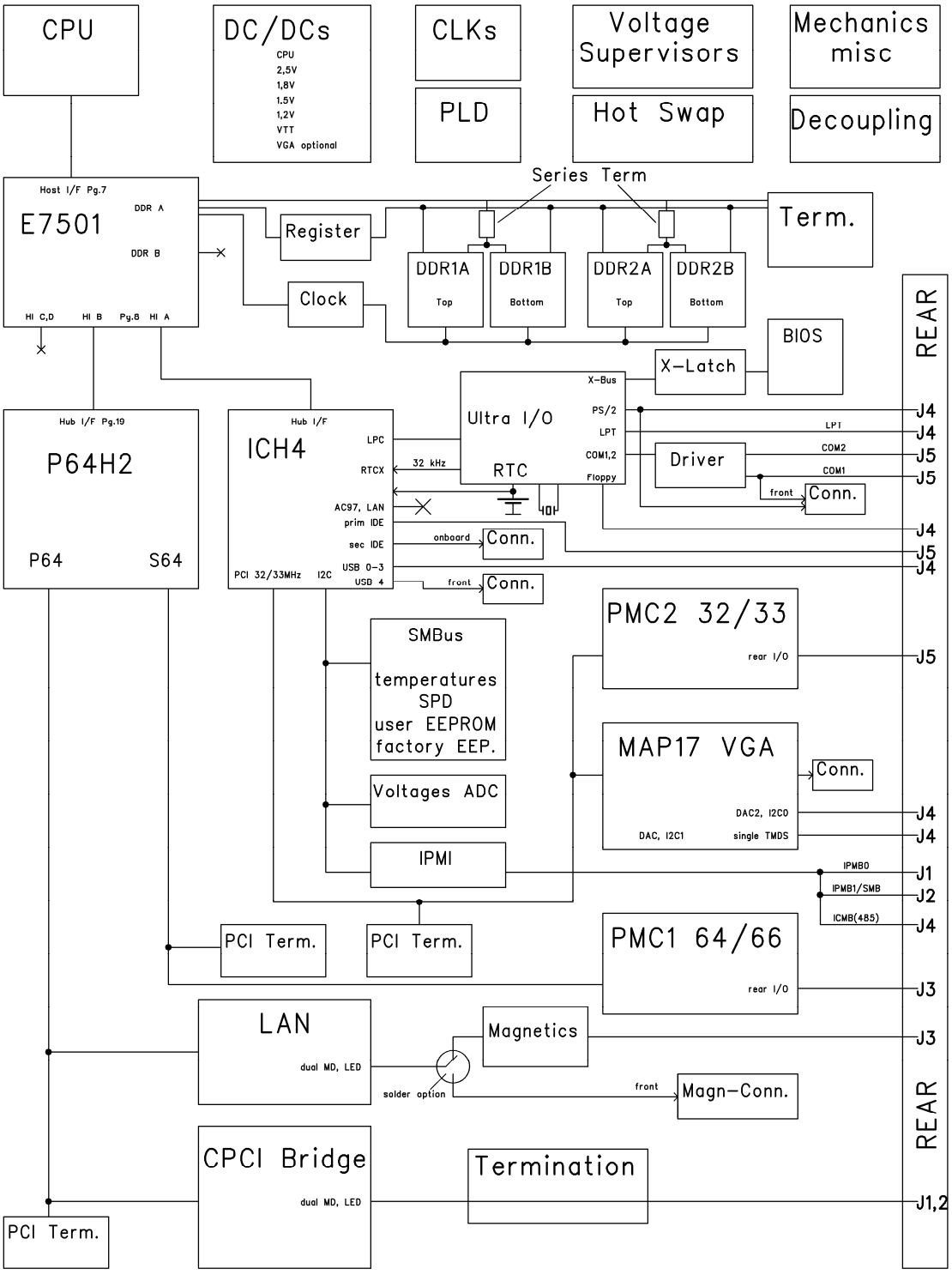

Figure 2: Logical diagram of Cx9 board

Design Features

The Cx9 CompactPCI Single Board Computer features:

Microprocessor
Intel® Pentium® M processor 600 MHz to 1.8 GHz and higher,
Intel® Celeron® M processor 1.3 GHz

Chipset
Intel E7501 with ICH4 and a P64H2 PCI bridge

CMOS RAM
114 byte non-volatile RAM
MC146818 compatible RTC with onboard Lithium battery

EEPROM (Serial)
512 Bytes or 64 KBytes for user information

DRAM
256 MB to 2 GB DDR 200 MHz with ECC

Flash BIOS
Easy updating, in-system programmable
AMIBIOS
Intel Ethernet BOOT module

Keyboard/Mouse
IBM PC/AT compatible keyboard controller with PS/2 style connector

LCD/VGA
Version 2.x uses the NVIDIA® GeForce™ 420 Go series high performance graphics controller with integrated DDR memory 16 or 32 MBytes, max. resolution at DVI port 1024x768, at CRT 1600x1200
Version 3.x (RoHS version) uses the ATI Mobility™ Radeon™ graphics controller with 128/256 bit 2D, 3D and multimedia graphics accelerator, 16 MB to 64 MB DDR memory, max. resolution 1600 x 1200 analog and 1024 x 768 DVI

USB
One front and 4 rear USB 2.0 ports

Watchdog
Watchdog implemented in ICH4 chipset and National PC87417 Super I/O

High Resolution Timer
User programmable timer, allows ‘Real Time Functions’ implemented in chipset

Fast Ethernet
Two 10/100/1000BaseT high speed Ethernet channels either front or rear (PICMG 2.16) with Intel 82546GB Ethernet controller

Hard/Flash Disk
Onboard mountable 2.5” IDE hard disk or Flash Drive

Floppy
Supported formats: 3.5 inch, 720 kBytes - 1.44 MBytes

EIDE/ATAPI
UDMA 100 EIDE/ATAPI interface within ICH4 with two IDE channels (primary IDE off-board and secondary IDE on-board). Transfer rate with up to 100 MB/s, for two external devices (master/slave) and one onboard 2.5" hard/flash disk. The onboard (secondary) interface is limited in speed to UDMA 2 (33.3 MB/s) because of cable/connector restrictions.

Serial I/O
National PC87417 Super I/O with two asynchronous 16550 compatible channels with 16 byte FIFO, Transfer rates up to 115.2 KBaud user selectable RS232/422/485

Parallel I/O
Fully bidirectional IEEE 1284 enhanced parallel port support ECP and EPP modes

PMC slots
One 64 Bit/66 MHz (3.3 V IO voltage signaling) and one 32 Bit/33 MHz (5 V IO voltage signaling) PCI mezzanine connector for standard PMC with front and rear I/O
I/O signals available at the rear connectors
With PCB version V2 the 64 bit PMC lot is PCI-X capable with 66/100/133 MHz

CPCI System slot
Up to 7 peripheral slots 64 Bit CPCI/33 MHz with Hint HB6 bridge (Up to 4 peripheral slots 64 Bit/66 MHz). Standard backplanes can be used. Onboard Pullup resistors are optimized for 3.3 V I/O voltage, but 5 V I/O can also be used for 33 MHz.

CPCI I/O Slot
Cx9 works as peripheral board 64 Bit or 32 Bit with 66 MHz or 33 MHz and Hot Swap functionality.

IPMI (CT9)
Hitachi controller for support of Intelligent Peripheral Management Interface.

Temperature Sensors
Measure temperatures of CPU-die and three onboard locations. The sensors are software readable in 1 °C increments from -55 °C to +125 °C.

Front panel I/O
2 x Ethernet, VGA, PMCI/O, COM1, KB/MS, USB1, Reset, 3xLED (blue: Hot Swap; green, red: user definable) depending on the board configuration.

Back panel I/O
TMDS,VGA, LCD, IDE (Master/Slave), FDC, COM1-2, LPT, USB2-5, 2x PMCI/O, KB, MS, speaker, reset, ext. Battery, SMBus, IPMB, GPIO[0...7], 2x Ethernet. Transition modules with 1:1 PC compatible connectors are available.

Power supply Usage
+5 V and +3.3 V for board supply
+12 V for PMC and Hot Swap controller supply
-12 V optional, if needed on PMC

Note:
The Cx9 boards shows a height violation which is to be checked if a PMC mezzanine module needs to be installed into the central area of the board (PMC1).

Approval
Designed to meet standard UL1950, CE class A, FCC-A

H110 Backplanes
The CT9 can be optionally ordered without connector J7004 (=CPCI J4) assembled for backplanes providing H110 functionality. As a consequence some rear I/O will not be available. Please check in Chapter 4 in the Interfaces section for more details.

Styles available

Table 1: Styles available

Cx9 (non-ROHS)	C	D	I	H	R	N
Cx9 (RoHS)	1	2	3	4	6	8
Front panel	x	x	x	x	x	
Extended temp.			x	x	x	x
Parts soldered					x	x
Middle stiffener bar					x	x
Wedge locks						x
Conformal coating		x		x	x	x
Conduction cooling						x
Onboard battery	x	x	x	x		
Onboard speaker	x	x	x	x	x	

CT9 and CP9 can only be ordered in C-, 1- or I-, 3-style.

CHAPTER 2 Unpacking and Inspection

Chapter Scope

This chapter covers the suggested inspection and preparation considerations and background information necessary prior to using the Cx9. Unpacking, initial inspection, and first-time operation of the Cx9 are covered. Following the procedures given in the chapter is recommended, since they will verify proper operation after shipping and before the product is integrated into your system.

Delivery Volume

Please check that the delivered package contains the following items:

Table 2: Delivery volume

Qty.	Item	Purpose
1	CR9 or CP9 or CT9	CompactPCI Single Board Computer
1	CDROM	Technical Product Information with driver software and manuals in Adobe Acrobat (PDF) format

The manual files are also available through the World Wide Web from our Web-Server: http://www.sbs.com

Available Accessories

The following table lists accessory options which are available for the Cx9:

Table 3: List of accessory options

Item	Purpose
ZKAAPS2SPLIT	Front panel Y-cable for keyboard and mouse
CTM12	Transition module, 6U x 4HE/HP
VGA2DVI	DVI to standard VGA converter

Please contact the sales department or your sales representative for latest information on options and accessories.

Accessories are subject to change without notice.

ESD

Electrostatic Discharge Notice

The discharge of static electricity, known as Electro Static Discharge or ESD, is a major cause of electronic component failure. The Cx9 has been packed in a static-safe bag which protects the board from ESD while the board is in the bag. Before removing the Cx9 or any other electronic product from its static-safe bag, be prepared to handle it in a static-safe environment.

You should wear a properly-functioning antistatic strap and ensure you are fully grounded. Any surface upon which you place the unprotected Cx9 should be static-safe, usually facilitated by the use of antistatic mats. From the time the board is removed from the antistatic bag until it is in the card cage and functioning properly, extreme care should be taken to avoid ‘zapping’ the board with ESD. You should be aware that you could ‘zap’ the board without you knowing it; a small discharge, imperceptible to the eye and touch, can often be enough to damage electronic components. Extra caution should be taken in cold and dry weather when static easily builds up.

Only after ensuring that both you and the surrounding area are protected from ESD, carefully remove the board or module from the shipping carton by grasping it by the front panel and the connectors. Place the board, in its antistatic bag, flat down on a suitable surface. You may then remove the board from the anti static bag by tearing the ESD warning labels.

Warning

This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

Notes:
Drain static electricity before you install or remove any parts. Installing or removing modules without observing this precaution could result in damage to this and/or other modules in your system.

Initial Inspection

After unpacking the Cx9, you should inspect it for visible damage that could have occurred during shipping or unpacking. If damage is observed (usually in the form of bent component leads or loose socketed components), contact SBS Technologies for additional instructions. Depending on the severity of the damage, it may need to be returned to the factory for repair**. DO NOT apply power to the board if it has visible damage.** Doing so may cause further, possibly irreparable damage, as well as introduce a fire or shock hazard. Since the Cx9 incorporates a number of socketed components, including the CPU, memory, etc., these should be inspected to make sure they are seated fully in their sockets.

Since some of the boards or modules incorporate a number of socketed components, including the CPU, memory, etc., these should be inspected to make sure they are seated fully in their sockets.

Note
Please observe all safety procedures to avoid damaging system and protect operators and users.

Unpacking

Please read the manual carefully before unpacking the board or module or fitting the device into your system. Also adhere to the following:

- Please read this manual carefully before unpacking the module or fitting it into your system. This will certainly save time and avoid trouble.
- Observe all precautions for electrostatic sensitive modules
- If the product contains batteries, please do not place the board on conductive surfaces, antistatic plastic, or sponge, which can cause shocks and lead to battery or board trace damage.
- Please do not exceed the specified operational temperatures. Note that batteries and storage devices might also have temperature restrictions.
- Keep all original packaging material for future storage or warranty shipments of the board.

Although the Cx9 is carefully packaged to protect it against the rigors of shipping, it is still possible that shipping damages can occur. Careful inspection of the shipping carton should reveal some information about how the package was handled by the shipping service. If evidence of damage or rough handling is found, you should notify the shipping service and SBS Technologies as soon as possible.

Retain all packing material in case of future need.

Note
Before installing or removing any board, please ensure that the system power and external supplies have been turned off.

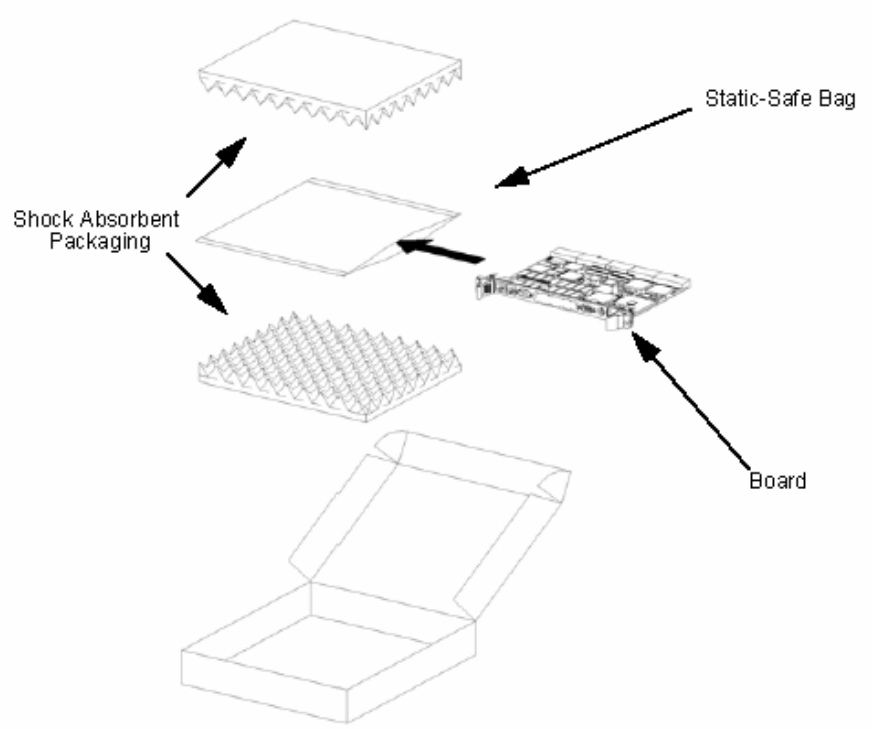

Figure 3: Board packaging

Handling

Proper handling of the Cx9 is critical to ensure proper operation and long-term reliability. When unpacking the board, and whenever handling it thereafter, be sure to hold the board by the front panel or the card ejectors as shown in the drawing on the left. Do not hold the board by the circuit card edges, the heat sink, or the connectors.

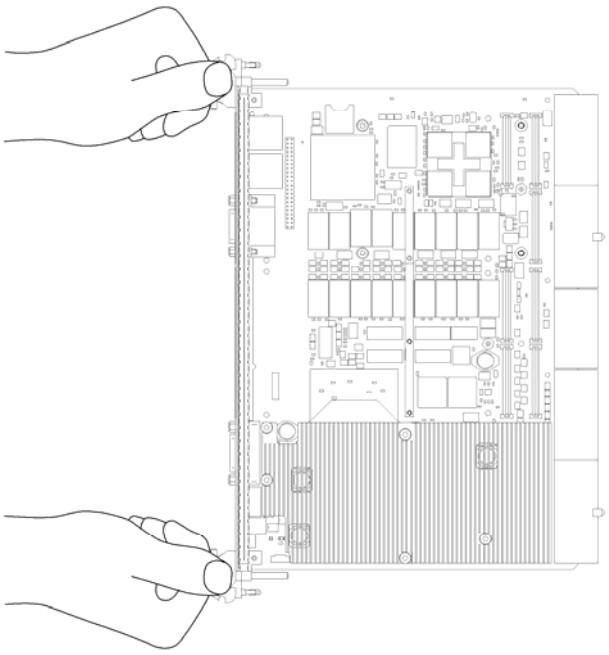

Figure 4: Handling the Cx9 board

CHAPTER 3 Installation

Chapter Scope

This chapter covers the installation of the Cx9 CompactPCI Single Board Computer in a CompactPCI backplane and initial power-on operations.

Installation preparation

Use the following steps to install your SBS Technologies hardware.

- Before installing or removing any board, please ensure that the system power and external supplies have been turned off.
- Check that the jumpers and mezzanines are correctly configured for your application.
- Mount the board/mezzanine/transition module very carefully. See also additional advisories for VMEbus and CompactPCI products below.
- Connect all IO cables.
- Once you are certain that all modules are correctly fitted into the system and all connections have been made properly, restore the power.

General Advisories

Before installing or removing any board, please ensure that the system power and external supplies have been turned off.

Check that jumpers and mezzaniness are correctly configured for your application. Mount the board, mezzanine, or transition module very carefully. See also sections on additional advisories below.

Do not restore power until you are sure that all modules are fitted correctly and all connections have been made properly.

Advice on CompactPCI products

Mount the CPU board carefully on the first CPCI bus slot (called system slot). Note that on some boards connectors are used for IO purposes which must not

be inserted into a CPCI bus backplane. A transition module must be used instead.

Because the board is available in several options the description in this chapter is related to the standard configuration.

Note:
Make sure that the card ejectors are closed and the Hot Swap LED (blue) is OFF.

Required items

The following items are required to start the Cx9 in a standard configuration:

Backplane and Power Supply

You will need a standard CompactPCI backplane wired into a regulated power supply capable of providing stable low noise +5 V, +3.3 V and +12 V sources. Make sure that the supply is capable of meeting the total power requirements of the Cx9. Please refer to chapter ‘Specifications’ on page 75 for details.

The Cx9 features Full Hot Swap capabilities according to the PCI Hot Plug specification PICMG 2.1. This allows orderly insertion and extraction of the board from the system host (backplane) without having to power down the system. Please note that this feature requires that Hot Swap functions are also available on the backplane. See chapter ‘Hot Swap’ on page 70 for details.

Initially, you may plug the Cx9 into your 6U system slot of your CPCI system. Optionally, when used as an intelligent peripheral board, the Cx9 can also be used in a non-system slot. In case that the Cx9 is used in a non-system slot you have to have an additional CPU board in the system slot for providing system clock, arbiter function and more. Please make sure that you do not have the power supply turned ON when the Cx9 is plugged into your backplane.

Keyboard and Mouse

You should have a compatible keyboard for initial system operation. Depending on your application, this keyboard may be a standard full-travel keyboard, or one which utilizes membrane switches for harsh environments. The miniature DIN keyboard connector is located on the front panel and is directly compatible with existing compliant keyboards. If your keyboard has the normal IBM PC-type keyboard connector you will need to use a cable adapter. This cable adapter is not delivered by SBS, but available on the shelf.

The connector is defined for both keyboard and mouse. SBS delivers a split adapter cable for keyboard and mouse, which has to be ordered separately. Plug this adapter cable ZKAAPS2SPLIT (Y form) into the keyed PS/2 connector on the front panel, then plug the keyboard and mouse into the adapter. If the adapter is not used, only a keyboard can be connected.
Plugging and unplugging a PS/2 keyboard or mouse while power is applied is not recommended and can cause software failure or damage to the PS/2 device and/or on-board circuitry. For proper function please use the split adapter delivered by SBS.

Video Monitor

Any VGA-compatible video monitor can be used initially for display output. The Cx9 offers front access to the video. Video can also be accessed via the J5 CPCI connector on the rear I/O side. In order to get access to these pins it is necessary to use a transition module.

Advice on Batteries

There is a danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by SBS Technologies. Dispose of used batteries according to instructions of SBS Technologies and applicable local regulations.

Installation of a plug-in board

Boards are installed in a CPCI or VMEbus chassis by carefully sliding them into the guide rails, inserting them all the way until the handles can be operated to seat and lock the board in place. Handles typically have a lock (snap lever) to unlock them when extracting a board. Older boards may have screws instead of handles to secure the board in place.

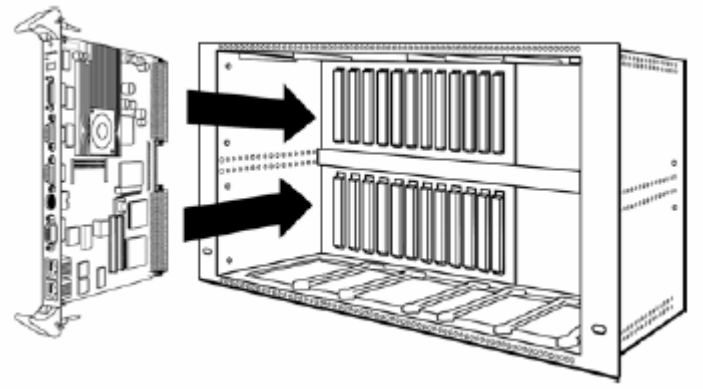

Figure 5: 6U board insertion into system box

Installation of a plug-on module (mezzanine)

After making sure that you have installed the mezzanine properly onto your carrier board and installed both properly into a system shelf (subrack, card cage, enclosure), apply power to your system. When the board is completely reset, the processor should begin executing initial BIOS-resident routines indicated by the on-board status LED blinking red.

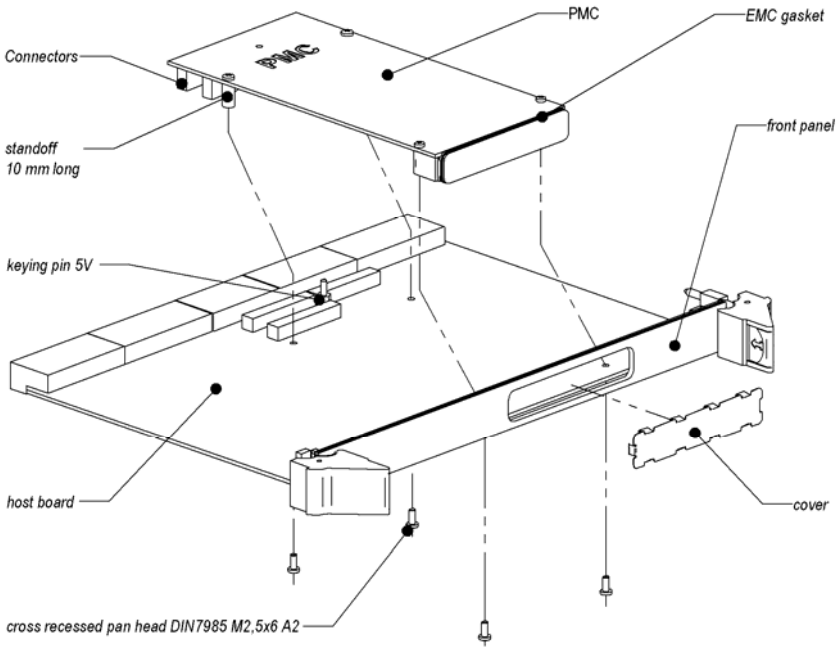

Figure 6: Installing a PMC on a 6U CPCI carrier board

Note:
The carrier board might be of different size, like 6U (as shown here) or 3U or other form factor. It may conform to different board architectures, like CPCI (as shown here) or VMEbus or other architecture.

Installation of the Rear Transition Module CTM12

The CTM12 is a 6U x 80 mm rear I/O module which has to be plugged into the Cx9 separated by the backplane. This transition module has a DVI-I connector. If necessary you need an external adaptor to be fully compatible with the VGA standard connector and pin assignments. On the transition module you either can connect a DVI panel or a standard VGA Monitor, but not both at the same time.

Plug your video monitor into this connector. Make sure that your selected chassis supports this type of rear I/O transition module.

After making sure that you have installed the Cx9 properly into your CPCI backplane, apply power to your video monitor and then the CPCI supply. When the board is completely reset, the processor should begin executing initial BIOS-resident routines.

Note:
Make sure that the card ejectors are closed and the Hot Swap LED (blue) is OFF.

Note:
If the Cx9 was ordered without video on board, you can use an external video CompactPCI card or a video PMC module. Consult the technical descriptions of these boards for required voltage and power consumption in the system.

Or use a terminal on COM1. Provide Port Settings – Bits, Data Bits, Parity and Stop Bit.

Initial Power-On Operation

After some seconds, the Cx9 system BIOS banner will display on the and the red LED on the front will get non-blinking green.

If you have seen all the messages to this point, you can be confident that the board is running properly and is ready to be installed and setup for your application.

Entering the BIOS SETUP

To enter SETUP during the initial power-on sequence press the DELETE key during the boot up sequence. Check the on-screen messages. This tells you when you can enter the BIOS by pressing the DELETE key. If this message does not appear on your monitor, just press the DELETE key when you hear short beeps indicating the keyboard was initialized. You may also press the DELETE key when the LED goes from blinking orange to blinking green.

Consult the 'AMI-BIOS for CR9, CP9, CT9 User's and Programmer's Manual' for further information on how to change settings and configurations.

If the board does not perform as described above, some damage may have occurred in shipping or the board is not installed or setup properly. Contact SBS technical support as described in chapter 'Support, Service, and Warranty Information' for further instructions.

If the BIOS setup is wrong in the CMOS RAM, then please press the '0/INS'key or the 'INS' key during boot up. This clears the CMOS settings and stops the video output at an early stage. There you can also see the BIOS ID line:

Example/coding of the ID line:

Table 4: BIOS ID line

62 –	0102 –	004199 –	00101111 –	071595 -	E7501 –	CR9–	Y2KC-0
processor, flash ROM size	major & minor BIOS revisions	supplier ID	BIOS features	AMIBIOS core copyright date	Chip set	project ID	year 2000 compliant

CHAPTER 4 Getting Started

Chapter Scope

This chapter gives some useful tips when using a board from Cx9 family the first time. It might be also useful to read this chapter carefully, when problems came up in using the Cx9.

Power Supply

All boards of the Cx family require up to 50 Watts from the power supply. For exact values please check the actual datasheet, but for rough data a current of up to 7 A at the 5 V rail and 12 A at the 3.3 V rail must be taken into consideration. The +12 V must only supply a few mA and is not very critical. If there are harddisc or PMC modules attached to the Cx9, then their power consumption must also be calculated. Keep in mind, that standard power supplies often require minimum loads on every supply voltage fro proper operation. It might be necessary to add a load to the +12 V to ensure correct voltage levels on 3.3 V and 5 V.

If you ever see the board not starting well or doing resets at random states, please check the voltage of the three supply voltages at the backplane. When measuring there, you can use a standard digital multimeter and you have to attach it to the backplane at positions where no high current is flowing. So better use rear contacts of the bus connectors or unused power connectors to measure, because measuring the voltages at the used power connectors can result in wrong values, which are caused by the high current flowing.

The +12 V are less critical, but 5 V and 3.3 V should reach their nominal value when measuring with a multimeter. If the voltages are less than 5.0 V or 3.3 V, then short voltage drops while the CPU or memory gets into high activities may result in resetting the Cx9 board.

Status indicator, Postcode and Beeps

The Cx9 family has a dual color LED at the front panel for a quick status indicator usage. The possible colors are red, orange or green and the LED can blink in different frequencies or be on continuously.

The CR9, CP9, CT9 additional have a blue Hot Swap LED as required according to the PICMG specification. This blue LED is also an indication for a reset condition.

While running its BIOS initialization all boards of the Cx9 family write postcodes (POST = Power-On Self Test) to port 80h at the PCI bus 0 (at PMC2). These accesses can be monitored with appropriate equipment or a PMC post card. For easier access the postcodes are sent also to the parallel port LPT1 data lines. When measuring their values or adding 8 LEDs with current limiting resistors to GND, you can follow the POST sequence of the BIOS. When the boot process stops at a certain point also the eight voltage levels can be measured with a multimeter.

- Currently some more debug support is integrated on the Cx9 family, which beeps the postcode if the POST stops before the CRT is initialized. This POST beep support can be removed at a later development stage, if the required space within the onboard programmable logic is no longer available, so don't rely on this. The beeps are long for a '1' and short for a '0'. They start with the highest bit 7 and beep 8 represents the lowest bit 0. After some seconds the beep sequence is repeated for an easier recognition. If the beep code is not repeated, then this beeps are issued within the BIOS execution to show some other failures (i.e. fails in memory detection or if no VGA is detected). For more information please check the AMIBIOS8 Check Point and Beep Code List as well as the AMIBIOS8 Error Messages.

Booting

When switching-on the Cx9 following steps are done by hardware:

- On the CR9 family, all voltages at the backplane are observed until they reach a first trip point which is 2.5 V at the 5 V/3.3 V rails and 9.5 V at the +12 V rail. After this the onboard voltages are controlled raised up to the external supplied value
- The continuous red Status LED shows that all circuitry is in reset
- All onboard DC/DC converters are ramped up
- If all onboard supply voltages are at their correct values, the 'power good' status is acknowledged to all onboard devices and the red LED is switched off
- On the CR9 family, the blue Hot Swap LED is switched off when the onboard PCI reset is released. Especially when the battery is removed, this can take a few seconds to start the 32 kHz Oscillator. The PCI reset gets inactive after this period.
- After this the CPU start reading it first instructions from BIOS. Very soon the red LED is programmed to a red blinking state and the first postcode is issued
- If the CPU does not start correctly, the red LED keeps off until the hardware watchdog will issue a further reset 1.6 seconds later. You can see this at the red LED, which is on again for a short moment (at the CR9 family also the blue LED). This sequence continues until the CPU starts correctly.

For reference the complete BIOS boot sequence is shown with the current BIOS version. This version is a rather early one and hopefully some of the long periods will speed up. The times depend mainly on the memory size and they are measured with 1 GB and quick boot enabled. Some of the postcodes are 16 bit, but only the lower 8 bits can be seen at the parallel port data lines. All postcodes are shown in hex.

Table 5: Boot timing

Time after releasing PCI reset	POSTCODE	Status LED	Comment
1 µs	D0	Red 1 Hz blinking	
726 ms	AC	Orange 1 Hz blinking	All memory is initialized
3.9 s *1	D4		
8.4 s	D6		
12.2 s	D7		
12.3 s	03	Green 1 Hz blinking	Keyboard enabled *2
12.7 s	4013	Green 2 Hz blinking	
15.2 s	202A		Video Bios is started *3
16.9 s	3C	Green 3 Hz blinking	
17.2 s	78		Starting external BIOS *4
17.2 s	8C	Green 4 Hz blinking	
17.3 s	00	Green steady on	Try booting from mass storage

*1 from here add 2.9 seconds for 2 GBytes of memory
*2 now is the right point to press DEL if you want to go to BIOS SETUP
*3 CRT and/or panel are now initialized and show the startup screen.
*4 external BIOS from add on cards i.e. SCSI

Depending on the monitor/display type it may need some additional seconds until you can see something on the screen

Setup

When you want to enter the BIOS Setup, you have to press the keyboard ‘DEL’ key at the right moment. Especially when using a slow starting monitor it might be too late to wait for the CRT to show the message ‘Press DEL to enter Setup’. Better look for the LED and press ‘DEL’ as soon as the LED goes from orange to green blinking. When you are using add on cards with external BIOS, you can hit the DEL key while their BIOS runs (i.e. SCSI BIOS device scan). When you miss the right moment to press the DEL key, please use the reset button on the front panel to restart the power up sequence or switch off the power supply for a few seconds and restart it. With the current BIOS pressing the Ctrl-Alt-Del key combination at this boot-moment will result in switching to the next bootable device and try to boot from this. This feature cannot be disabled within Setup.

Hot Swap on Cx9

The Cx9 family supports full Hot Swap according to CPCI specification 2.1. This includes all hardware functionality to detect other bus cards or devices to be plugged in or removed while the system is running under power. Also the Cx9 can be hot plugged to a running system or be removed from it.

The necessary software/driver and operating system handling is not done within the BIOS of the Cx9, because all the tasks to recognize new inserted boards, to re-enumerate the PCI memory space while other cards/transfers are still running, cannot be done within BIOS. These tasks have to be fully done from the used operating system. Currently SBS Technologies have no drivers to support these functionalities.

The handling of the blue LED is also done within the necessary drivers. So do not expect the blue LED to go on and off according to the CPCI specification if no driver is loaded.

Unexpected Resets

Whenever the Cx9 unexpectedly issues a reset and starts booting again, you may want to know the reset source. For this reason a set of special registers is implemented onboard. Every reset source set there a special bit and can be read in the next boot up. The register description can be found in the ‘Board Specific Hardware Programmer’s Manual’.

CHAPTER 5 Interfaces

Chapter Scope

This chapter describes the interfaces of the Cx9 CompactPCI Single Board Computer located on the board and on the front panel. Each section on a particular interface includes a graphics illustration of the connector and a pin assignment table as well as notes on certain signal line characteristics, if necessary.

For interfaces of the transition module, please refer to the appropriate chapters found in the 'Appendices' to this manual.

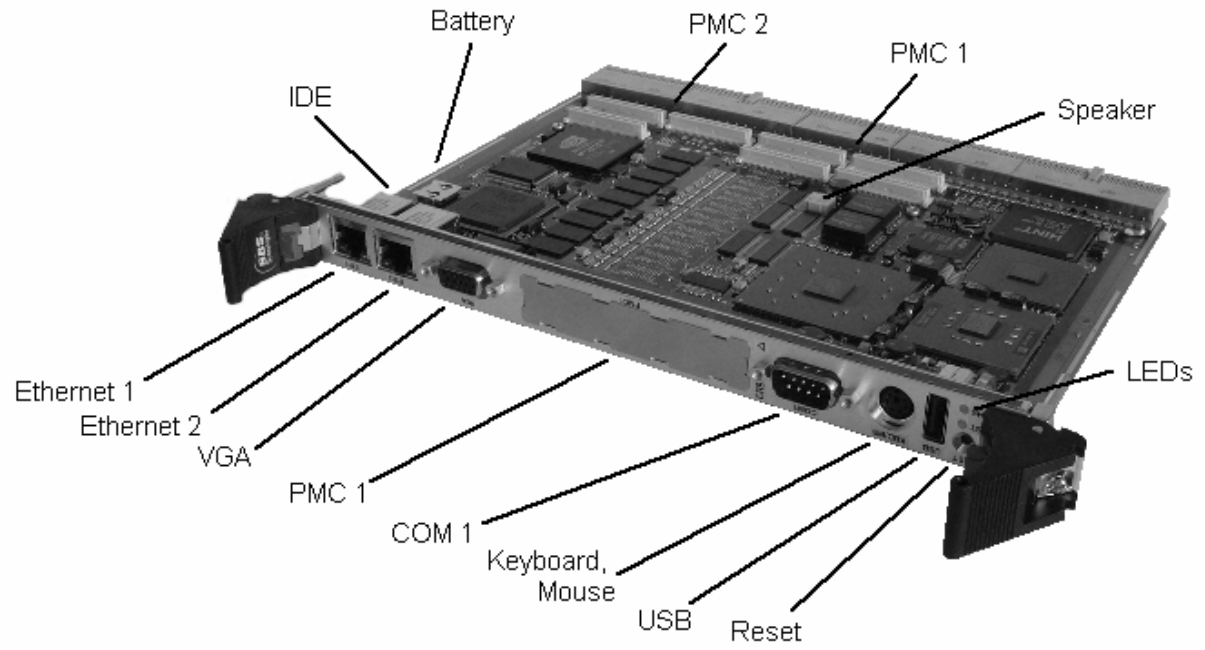

Figure 7: Location of components on board and front panel

Front Panel Interfaces

Refer to the next drawing for the location of interfaces on the front panel of the CR9 and CT9 single slot board (either with front I/O or with dual PMC):

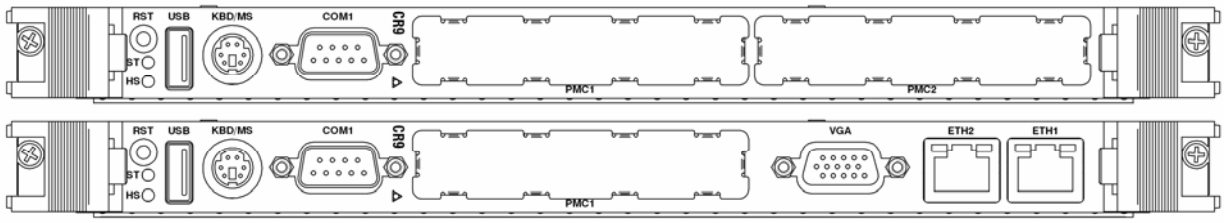

Figure 8: Single slot front panel

This drawing indicates the location of interfaces on the front panel of the CP9 dual slot board:

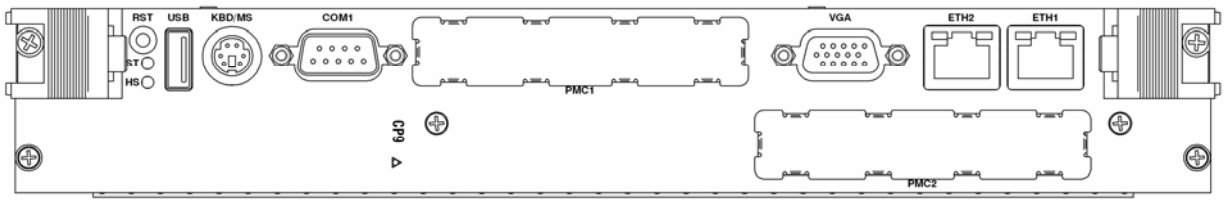

Figure 9: Dual slot front panel

Cx9 Connectors

This chapter describes connector pin assignments on the Cx9. A pin assignment description for available transition module can be found in the corresponding appendix chapters.

CPCI connector reference

The CPCI specification numbers the CPCI connectors from bottom to top J1, J2, J3, J4, and J5. The CPCI connectors on the Cx9 are J7001, J7002, J7003, J7004, and J7005 respectively.

Table 6: Signal name groups

Signal groups	Determiner
floppy disk controller signals	\FD....
hard disk controller signals	HD.... and \HD....
Parallel port	L1... and \L1....
COM1, COM2 signals	C1....., C2.....
VGA signals	VGA…
Universal Serial Bus	USB…
keyboard signals	KB…
mouse signals	MS…
LCD signals	TX…
LAN signals	RJ…
SMB (I2C-Bus)	SMB…
IPMI	IPMI…
Misc. signals	\SPEAKER
	\RST_BUT
	VBATIN
PMC IO Signals	PMC...
NC:	not connected

CompactPCI bus Connector J7001 and J7002

This interface is used for connection to a standard CPCI backplane.

Table 7: CPCI connectors

J7002	A	B	C	D	E	F
22	GA4	GA3	GA2	GA1	GA0	GND
21	CLK6	GND	NC	NC	NC	GND
20	CLK5	GND	NC	GND	NC	GND
19	GND	GND	SMB_SDA [d]	SMB_SCL [d]	SMB_ALRT#	GND
18	NC	NC	NC	GND	NC	GND
17	NC	GND	\PRST	\REQ6	\GNT6	GND
16	NC	NC	\DEG [c]	GND	NC	GND
15	NC	GND	\FAL [c]	\REQ5	\GNT5	GND
14	AD35	AD34	AD33	GND	AD32	GND
13	AD38	GND	VIO [b]	AD37	AD36	GND
12	AD42	AD41	AD40	GND	AD39	GND
11	AD45	GND	VIO [b]	AD44	AD43	GND
10	AD49	AD48	AD47	GND	AD46	GND
9	AD52	GND	VIO [b]	AD51	AD50	GND
8	AD56	AD55	AD54	GND	AD53	GND
7	AD59	GND	VIO [b]	AD58	AD57	GND
6	AD63	AD62	AD61	GND	AD60	GND
5	C/\BE5	\64EN	VIO [b]	C/\BE4	PAR64	GND
4	VIO [b]	NC	C/\BE7	GND	C/\BE6	GND
3	CLK4	GND	\GNT3	\REQ4	\GNT4	GND
2	CLK2	CLK3	\SYSEN	\GNT2	\REQ3	GND
1	CLK1	GND	\REQ1	\GNT1	\REQ2	GND
J7001	A	B	C	D	E	F
25	+5V	\REQ64	ENUM	+3.3V	+5V	GND
24	AD01	+5V	LVIO [a b]	AD00	\ACK64	GND
23	+3.3V	AD04	AD03	L+5V [a]	AD02	GND
22	AD07	GND	L+3.3V [a]	AD06	AD05	GND
21	+3.3V	AD09	AD08	M66EN	C/\BE0	GND
20	AD12	GND	VIO [b]	AD11	AD10	GND
19	+3.3V	AD15	AD14	GND	AD13	GND
18	\SERR	GND	+3.3V	PAR	C/\BE1	GND
17	+3.3V	IPMB_SCL	IPMB_SDA	GND	\PERR	GND
16	\DEVSEL	GND	VIO [b]	\STOP	\LOCK	GND
15	+3.3V	\FRAME	\IRDY	\BD_SEL	\TRDY	GND
12-14	KEY	KEY	KEY	KEY	KEY	KEY
11	AD18	AD17	AD16	GND	C/\BE2	GND
10	AD21	GND	+3.3Vnc	AD20	AD19	GND
9	C/\BE3	IDSEL	AD23	GND	AD22	GND
8	AD26	GND	VIO [b]	AD25	AD24	GND
7	AD30	AD29	AD28	GND	AD27	GND
6	\REQ0	\PCI_PRES	L+3.3V [a]	CLK0	AD31	GND
5	NC	NC	\RST	GND	\GNT0	GND
4	IPMI_PWR	\HEALTHY	LVIO [b]	INTP	NC	GND
3	\INTA	\INTB	\INTC	L+5V [a]	\INTD	GND
2	NC	+5V	NC	NC	NC	GND
1	+5V	-12V	NC	+12V	+5V	GND

[a] On long backplane pins for early power supply
[b] The VIO signals are not used by the Cx9. They are either 5 V or 3.3 V, depending on backplane
[c] These signals are not used on the Cx9
[d] These SMBus signals are not supported by the IPMI controller on the CT9

I/O Connector J7003, J7004, and J7005

The connector J7004 is not mounted on the CT9, if the H110-Bus is used on the backplane. For easy use a transition module is available from SBS Technologies to connect the I/O-Connectors with standard connectors.

Table 8: I/O connectors J7003 - …5

J7003	A	B	C	D	E	F
19	GND	GND	GND	GND	GND	GND
18	LPA_DA+	LPA_DA-	GND	LPA_DC+	LPA_DC-	GND
17	LPA_DB+	LPA_DB-	GND	LPA_DD+	LPA_DD-	GND
16	LPB_DA+	LPB_DA-	GND	LPB_DC+	LPB_DC-	GND
15	LPB_DB+	LPB_DB-	GND	LPB_DD+	LPB_DD-	GND
14	VCC3 [a]	VCC3 [a]	VCC3 [a]	VCC [a]	VCC [a]	GND
13	PMC1IO_05	PMC1IO_04	PMC1IO_03	PMC1IO_02	PMC1IO_01	GND
12	PMC1IO_10	PMC1IO_09	PMC1IO_08	PMC1IO_07	PMC1IO_06	GND
11	PMC1IO_15	PMC1IO_14	PMC1IO_13	PMC1IO_12	PMC1IO_11	GND
10	PMC1IO_20	PMC1IO_19	PMC1IO_18	PMC1IO_17	PMC1IO_16	GND
9	PMC1IO_25	PMC1IO_24	PMC1IO_23	PMC1IO_22	PMC1IO_21	GND
8	PMC1IO_30	PMC1IO_29	PMC1IO_28	PMC1IO_27	PMC1IO_26	GND
7	PMC1IO_35	PMC1IO_34	PMC1IO_33	PMC1IO_32	PMC1IO_31	GND
6	PMC1IO_40	PMC1IO_39	PMC1IO_38	PMC1IO_37	PMC1IO_36	GND
5	PMC1IO_45	PMC1IO_44	PMC1IO_43	PMC1IO_42	PMC1IO_41	GND
4	PMC1IO_50	PMC1IO_49	PMC1IO_48	PMC1IO_47	PMC1IO_46	GND
3	PMC1IO_55	PMC1IO_54	PMC1IO_53	PMC1IO_52	PMC1IO_51	GND
2	PMC1IO_60	PMC1IO_59	PMC1IO_58	PMC1IO_57	PMC1IO_56	GND
1	PMC1VIO	PMC1IO_64	PMC1IO_63	PMC1IO_62	PMC1IO_61	GND

J7004	A	B	C	D	E	F
25	NC	USB3-	USB2-	USB1-	USB0-	GND
24	NC	USB3+	USB2+	USB1+	USB0+	GND
23	\FD_DRVO	GND	GND	USBVCC	USBVCC	GND
22	\FD_MTRO	\FD_INDX	L_D7	L_D6	VGA_RED	GND
21	\FD_STEP	\FD_DCHG	L_D5	L_D4	VGA_GREEN	GND
20	\FD_WGAT	\FD_DIR	L_D3	L_D2	VGA_BLUE	GND
19	\FD_WPRT	\FD_WDAT	L_D1	L_D0	VGA_HSYNC	GND
18	\FD_HDSL	\FD_TRKO	\L_STRO	MS_CLK	VGA_VSYNC	GND
17	\L_ERROR	\FD_RDAT	\L_AFED	MS_DATA	VGA_DDCD	GND
16	\L_PE	\L_SLIN	\L_INIT	KB_CLK	VGA_DDCC	GND
15	L_SLCT	L_BUSY	\L_ACK	KB_DATA	HOTPLG	GND
12-14	KEY	KEY	KEY	KEY	KEY	KEY
11	\VCCOFF	NC	VBATIN	\SPEAKER	GPIO1	GND
10	NC	NC	NC	\RST_BUT	GPIO0	GND
9	NC	NC	NC	GPIO2	GPIO3	GND
8	NC	NC	NC	GPIO4	GPIO5	GND
7	NC	NC	NC	GPIO6	GPIO7	GND
6	NC	NC	NC	GND	GND	GND
5	\M1LINK1000	\M2LINK1000	NC	TX1-	TXC-	GND
4	\M1LINK100	\M2LINK100	NC	TX1+	TXC+	GND
3	\M1LINK	\M2LINK	NC	TX2-	TX0-	GND
2	\M1ACT	\M2ACT	NC	TX2+	TX0+	GND
1	VCC3 [a]	VCC3 [a]	VCC [a]	VCC [a]	-12V	GND

[a]. for internal use only.

J7005	A	B	C	D	E	F
22	PMC2IO_05	PMC2IO_04	PMC2IO_03	PMC2IO_02	PMC2IO_01	GND
21	PMC2IO_10	PMC2IO_09	PMC2IO_08	PMC2IO_07	PMC2IO_06	GND
20	PMC2IO_15	PMC2IO_14	PMC2IO_13	PMC2IO_12	PMC2IO_11	GND
19	PMC2IO_20	PMC2IO_19	PMC2IO_18	PMC2IO_17	PMC2IO_16	GND
18	PMC2IO_25	PMC2IO_24	PMC2IO_23	PMC2IO_22	PMC2IO_21	GND
17	PMC2IO_30	PMC2IO_29	PMC2IO_28	PMC2IO_27	PMC2IO_26	GND
16	PMC2IO_35	PMC2IO_34	PMC2IO_33	PMC2IO_32	PMC2IO_31	GND
15	PMC2IO_40	PMC2IO_39	PMC2IO_38	PMC2IO_37	PMC2IO_36	GND
14	PMC2IO_45	PMC2IO_44	PMC2IO_43	PMC2IO_42	PMC2IO_41	GND
13	PMC2IO_50	PMC2IO_49	PMC2IO_48	PMC2IO_47	PMC2IO_46	GND
12	PMC2IO_55	PMC2IO_54	PMC2IO_53	PMC2IO_52	PMC2IO_51	GND
11	PMC2IO_60	PMC2IO_59	PMC2IO_58	PMC2IO_57	PMC2IO_56	GND
10	PMC2VIO	PMC2IO_64	PMC2IO_63	PMC2IO_62	PMC2IO_61	GND
9	C1_DCD/TXD-	C1_DSR/TXD+	\PHD_CS0	\PHD_IOR	\PHD_IOW	GND
8	C1_RXD/RTS-	C1_RTS/RTS+	PHD_A0	PHD_D08	PHD_D07	GND
7	C1_TXD/CTS+	C1_CTS/CTS-	PHD_IRQ	PHD_D09	PHD_D06	GND
6	C1_DTR/RXD+	C1_RI/RXD-	PHD_RDY	PHD_D10	PHD_D05	GND
5	C2_DCD/TXD-	C2_DSR/TXD+	\PHD_DAK	PHD_D11	PHD_D04	GND
4	C2_RXD/RTS-	C2_RTS/RTS+	PHD_DRQ	PHD_D12	PHD_D03	GND
3	C2_TXD/CTS+	C2_CTS/CTS-	\PHD_CS1	PHD_D13	PHD_D02	GND
2	C2_DTR/RXD+	\PHD_RST	PHD_A2	PHD_D14	PHD_D01	GND
1	C2_RI/RXD-	\PHD_PDIAG	PHD_A1	PHD_D15	PHD_D00	GND

EIDE Connector P1800

The EIDE interface is designed as a 44-pin 2 mm pitch male onboard connector P1800 to fit directly to a 2,5-inch EIDE hard drive or flash disk. P1800 is the secondary EIDE interface of the onboard EIDE controller.

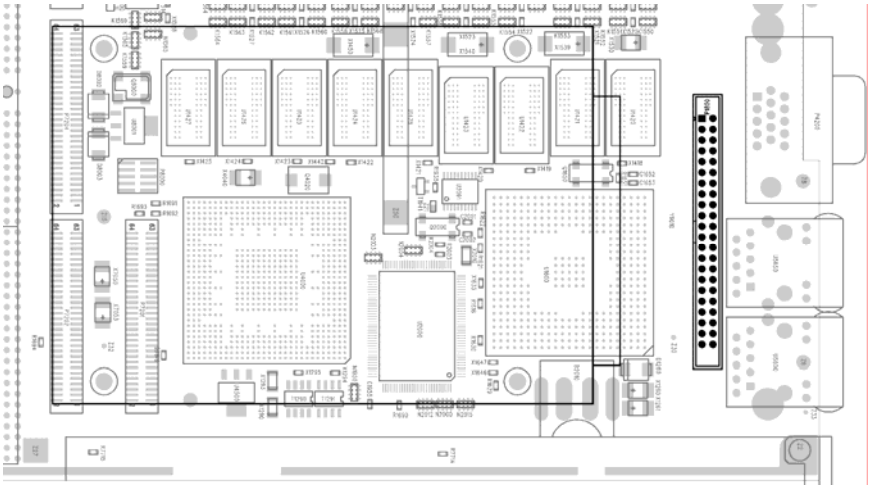

Figure 10: EIDE connector location

Table 9: EIDE connector

Name	P1800		Name
GND	2	1	\HD_RST
HD_D8	4	3	HD_D7
HD_D9	6	5	HD_D6
HD_D10	8	7	HD_D5
HD_D11	10	9	HD_D4
HD_D12	12	11	HD_D3
HD_D13	14	13	HD_D2
HD_D14	16	15	HD_D1
HD_D15	18	17	HD_D0
NC	20	19	GND
GND	22	21	HD_DRQ0
GND	24	23	\HD_IOW
GND	26	25	\HD_IOR
NC	28	27	HD_RDY
GND	30	29	\HD_DAK
NC	32	31	HD_IRQ
DIAG	34	33	HD_A1
HD_A2	36	35	HD_A0
\HD_CS1	38	37	\HD_CS0
GND	40	39	DASP
+5V	42	41	+5V
NC	44	43	GND

Keyboard and PS/2 Mouse Interface P2001

The Cx9 allows an easy adaptation of a keyboard to a standard 6-pin MINIDIN connector. Also a PS/2 mouse can be connected directly or via an external cable splitter.

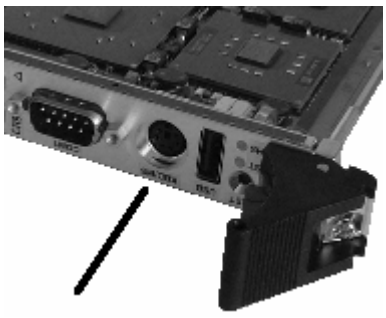

Figure 11: Keyboard & mouse connector location

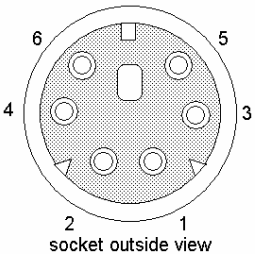

Figure 12: Keyboard & mouse connector layout

Table 10: Keyboard & mouse pin assignments

Name	P2001
Keyboard Data	1
Mouse Data	2
GND	3
Fused +5 V [a]	4
Keyboard Clk	5
Mouse Clk	6

[a] the Fused +5 V pin is fused with a 2 A fuse. For normal operation don't exceed 100 mA current. The used fuse does automatically recover if the over current is resolved.

Ethernet Interface U5600 and U5650

The Ethernet output front or rear can be selected via order. When ordered with front option, the connectors are located in the front panel.

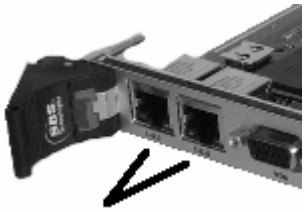

Figure 13: Ethernet connector location

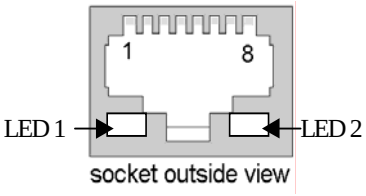

Figure 14: Ethernet connector layout

Table 11: Ethernet connector pin assignments

Name 10/100base	Name 1000base	Ethernet1, 2
TxD+	LP_DA+	1
TxD-	LP_DA-	2
RxD+	LP_DB+	3
NC	LP_DC+	4
NC	LP_DC-	5
RxD-	LP_DB-	6
NC	LP_DD+	7
NC	LP_DD-	8

Two LED's (LED1-green and LED2-yellow) are integrated in each of the RJ45 connector. These LED's indicate the link status and activity of the interfaces.

Table 12: Ethernet LED display definitions

LED1 green	Function
On	Link
Off	No link
LED2 yellow	**Function**
On, blink	Tx/Rx activity
Off	No activity

The pin assignment at the rear I/O is compliant with the PICMG 2.16 (Switched Packet Backplane) specification. The Ethernet interface can also be accessed via the CTM12 transition module (see Appendix A) for connector type and pin assignment.

Serial Port COM1 P2201

The Cx9 offers two RS232 serial ports. All COM ports are accessible via the transition module, and additionally COM1 is accessible via the front panel connector.

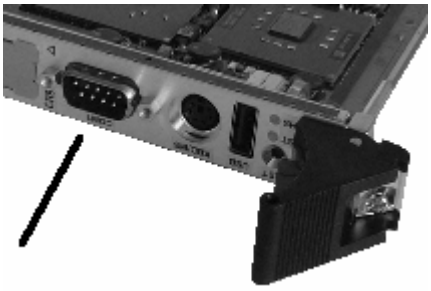

Figure 15: COM 1 location

COM1, 2 are software selectable for RS-232 or RS-422/485 operation within BIOS setup. The RS485 output drivers can be enabled or disabled with the DTR signal. An active DTR means the drivers to be enabled. When using the RS422 setting the output drivers are always enabled and the DTR signal is not used.

Table 13: COM 1 pin assignments

Name RS232	Name RS422/485	P2201
DCD	TXD-	1
DSR	TXD+	6
RXD	RTS-	2
RTS	RTS+	7
TXD	CTS+	3
CTS	CTS-	8
DTR	RXD+	4
RI	RXD-	9
GND	GND	5

VGA Interface P4200

The monitor signals are available at the front panel on a standard 15-pin female D-Sub connector.

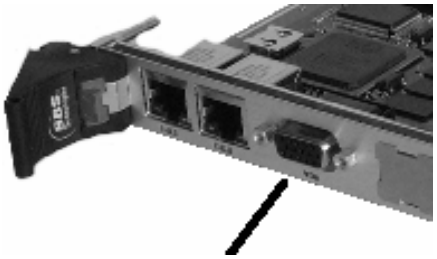

Figure 16: VGA connector location

Table 14: VGA connector pin assignments

Name	P4200
RED	1
GREEN	2
BLUE	3
HSYNC	13
VSYNC	14
DDC-Data	12
DDC-Clock	15
Fused +5 V [a]	9
GND	5, 6, 7, 8, 10
NC	4, 11

[a] the Fused +5 V pin is fused with a 2 A fuse. For normal operation don't exceed 100 mA current. The used fuse does automatically recover if the over current is resolved.

USB Interfaces P1680

One USB channel is available at the front panel and four USB devices are available on rear IO.

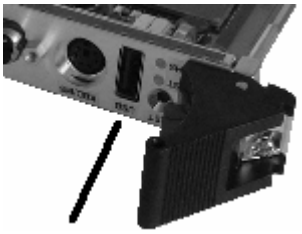

Figure 17: USB connector location

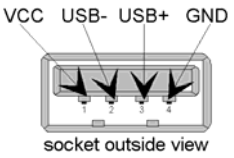

Figure 18: USB connector layout

Table 15: USB connector pin assignments

Name	P1680
Fused +5 V [a]	1
USB0-	2
USB0+	3
GND	4

[a] the Fused +5 V pin is fused with a 2 A fuse. For normal operation don't exceed 100 mA current. The used fuse does automatically recover if the over current is resolved.

PMC1 Connectors P6201, P6202, and P6203

The following table lists the pin assignments of the onboard PMC1 connector. The PMC1 slot is 64 bit and 66 MHz capable and works with the internal second PCI bus of the P64H2 PCI Bridge. If an installed PMC card operates at 33 MHz only the PCI bus speed is reduced to 33 MHz. With board revision V2 and higher, this slot is PCI-X capable with 66/100/133 MHz. The PMC is electrical and mechanical compliant to the specification IEEE 1386 and 1386.1 (check for possible height incompatibility in 'Features' and 'Specifications' sections of this manual) with enhancements of the Processor PMC Standard VITA 32-2003. The enhancements provide pins for a second device (IDSELB and REQB/GNTB) but don't support a monarch PMC card.

The PCI signaling voltage is fixed to 3.3 V. Nevertheless PMC cards with 3.3 V or 5 V supply voltage can be used on this PMC slot.

Table 16: PMC1 connector pin assignments

P6201	P6202	P6203	Pin	Pin	P6201	P6202	P6203
NC	+12 V	Reserved	01	02	-12 V	NC	GND
GND	NC	GND	03	04	PCIIRQ4#	NC	C/BE7
PCIIRQ5#	NC	C/BE6	05	06	PCIIRQ6#	GND	C/BE5
PRESENT#	GND	C/BE4	07	08	+5 V	Reserved	GND
PCIIRQ7#	Reserved	V(I/O)	09	10	Reserved	Reserved	PAR64
GND	PUP [a]	AD63	11	12	NC	+3.3 V	AD62
PCICLK	PCIRST#	AD61	13	14	GND	PDN [a]	GND
GND	+3.3 V	GND	15	16	GNT0#	PDN [a]	AD60
REQ0#	PME#	AD59	17	18	+5 V	GND	AD58
V(I/O)	AD30	AD57	19	20	AD31	AD29	GND
AD28	GND	V(I/O)	21	22	AD27	AD26	AD56
AD25	AD24	AD55	23	24	GND	+3.3 V	AD54
GND	AD29 (IDSEL)	AD53	25	26	C/BE3#	AD23	GND
AD22	+3.3 V	GND	27	28	AD21	AD20	AD52
AD19	AD18	AD51	29	30	+5 V	GND	AD50
V(I/O)	AD16	AD49	31	32	AD17	C/BE2#	GND
FRAME#	GND	GND	33	34	GND	AD30 (IDSELB)	AD48
GND	TRDY#	AD47	35	36	IRDY#	+3.3V	AD46
DEVSEL#	GND	AD45	37	38	+5 V	STOP#	GND
PCIXCAP	PERR#	V(I/O)	39	40	LOCK#	GND	AD44
Reserved	+3.3 V	AD43	41	42	RES.	SERR#	AD42
PAR	C/BE1#	AD41	43	44	GND	GND	GND
V(I/O)	AD14	GND	45	46	AD15	AD13	AD40
AD12	M66EN	AD39	47	48	AD11	AD10	AD38
AD9	AD8	AD37	49	50	+5V	+3.3 V	GND
GND	AD7	GND	51	52	C/BE0#	REQB#	AD36
AD6	+3.3 V	AD35	53	54	AD5	GNTB#	AD34
AD4	Reserved	AD33	55	56	GND	GND	GND
V(I/O)	NC	V(I/O)	57	58	AD3	NC	AD32
AD2	GND	Reserved	59	60	AD1	RSTOUT#	Reserved
AD0	ACK64#	Reserved	61	62	+5 V	+3.3 V	GND
GND	GND	GND	63	64	REQ64#	NC	Reserved

[a] Weak 10kΩ pull-down (PDN) to GND and pull-up (PUP) to VIO.

☞	NC	Not connected
	Reserved	Reserved. Do not connect anything
	V(I/O)	I/O Voltage, connected with +3.3 V
	-12 V	Only available if connected at the CPCI backplane.

PMC2 Connectors P7201, P7202

PMC2 is available on a CR9 and CT9 without the front Ethernet and/or front VGA connector. On a CP9 PMC2 is available in the second slot

The following table lists the pin assignments of the PMC2 connector. The PMC slot is 32 bit and 33 MHz capable and works with the internal primary PCI bus of the I/O Controller Hub.. The PMC is electrical and mechanical compliant to the specification IEEE 1386 and 1386.1 with enhancements of the Processor PMC Standard VITA 32-2003. Check for possible height incompatibility in ‘Features’ and ‘Specifications’ sections of this manual. The enhancements

provide pins for a second device (IDSELB and REQB/GNTB) but don't support a monarch PMC card.
The PCI signaling voltage is fixed to 5 V for this PMC2. Nevertheless PMC cards with 3.3 V or 5 V supply voltage can be used on this PMC slot.

Table 17: PMC2 connector pin assignments

P7201	P7202	Pin	Pin	P7201	P7202
NC	+12 V	01	02	-12 V	NC
GND	NC	03	04	PCIIRQ6#	NC
PCIIRQ7#	NC	05	06	PCIIRQ4#	GND
PRESENT#	GND	07	08	+5 V	Reserved
PCIIRQ5#	Reserved	09	10	Reserved	Reserved
GND	PUP [a]	11	12	NC	+3.3 V
PCICLK	PCIRST#	13	14	GND	PDN [a]
GND	+3.3 V	15	16	GNT0#	PDN [a]
REQ0#	PME#	17	18	+5 V	GND
V(I/O)	AD30	19	20	AD31	AD29
AD28	GND	21	22	AD27	AD26
AD25	AD24	23	24	GND	+3.3 V
GND	AD28 (IDSEL)	25	26	C/BE3#	AD23
AD22	+3.3 V	27	28	AD21	AD20
AD19	AD18	29	30	+5 V	GND
V(I/O)	AD16	31	32	AD17	C/BE2#
FRAME#	GND	33	34	GND	AD29 (IDSELB)
GND	TRDY#	35	36	IRDY#	+3.3 V
DEVSEL#	GND	37	38	+5 V	STOP#
GND	PERR#	39	40	LOCK#	GND
Reserved	+3.3 V	41	42	RES.	SERR#
PAR	C/BE1#	43	44	GND	GND
V(I/O)	AD14	45	46	AD15	AD13
AD12	GND	47	48	AD11	AD10
AD9	AD8	49	50	+5 V	+3.3 V
GND	AD7	51	52	C/BE0#	REQB#
AD6	+3.3 V	53	54	AD5	GNTB#
AD4	Reserved	55	56	GND	GND
V(I/O)	NC	57	58	AD3	EREADY
AD2	GND	59	60	AD1	RESETOUT#
AD0	PUP [a]	61	62	+5 V	+3.3 V
GND	GND	63	64	PUP [a]	NC

[a] Weak 10 kΩ pull-down (PDN) to GND and pull-up (PUP) to VIO.

NC	Not connected
Reserved	Reserved. Do not connect anything
V(I/O)	I/O Voltage, connected with +5 V
-12 V	Only available if connected at the CPCI backplane.

PMC-I/O Connector P6204 and P7204

Pin 1 of the I/O connector is PMCxIO_01; Pin 2 is PMCxIO_02 and so on. The x denotes PMC1 or PMC2 respectively. All traces are not connected to any

signal onboard and no pairs or length adjusted traces are used to route this signals to the backplane connectors.

Transition Module

Please refer to the appendix chapters for interface location and connector pin assignments for the optional extension boards and transition modules.

CHAPTER 6 Resources

Chapter Scope

This chapter describes system resources, such as memory mapping, register set and default interrupt request assignments.

Memory Map

The table below shows the memory address area used by the Cx9.

Table 18: Memory area assignments

Address	Size	Used by
$00000 - $9FFFF	640 kBytes	System RAM
$A0000 - $BFFFF	128 kBytes	Video RAM (if enabled)
$C0000 - $DFFFF	128 kBytes	Used by PCI ROMs: VGA, SCSI, Ethernet
$E0000 - $FFFFF	128 kBytes	System BIOS
$100000 - $3FFFFFFF	Depends on avail. DRAM	Extended RAM
$4000000 - $FFFBFFFF	Depends on avail. DRAM	Dynamically used by PCI devices
$FFF80000 - $FFFFFFFF	512 kBytes	System BIOS

Register Set

The following section provides an overview of the registers located in the I/O address area of the Cx9.

Note:
The address location of PCI devices such as SCSI or Ethernet are not described in the following tables because the System BIOS automatically configures (PnP, Plug and Play) each PCI device to avoid address conflicts. Many device drivers show the actual address locations after installation and loading.

Standard Register Set

The standard register set is the same as the standard PC/AT systems. The table below provides an overview of the address ranges occupied by these registers.

Table 19: Standard register set

I/O Address Range (Hex)	Function
0000 - 000F	DMA Controller 1
0020 - 0021	Interrupt Controller 1
0040 - 0043	Counter / Timer
0060	Keyboard Controller
0061	NMI Status and Control
0064	Keyboard Controller
0070 - 0071	RTC, NMI Mask
0080 - 008F	DMA Page register
00A0 - 00A1	Interrupt Controller 2
00B2 - 00B3	Power Management
00C0 - 00DE	DMA Controller 2
00F0 - 00F1	Coprocessor
0160 - 016F	Reserved [b]
0170 - 0177	Secondary EIDE
01F0 - 01F7	Primary EIDE
0278 - 027F	LPT [a]
02E8 - 02EF	COM port [a]
02F8 - 02FF	COM port [a]
0378 - 037F	LPT [a]
03BC - 03BF	LPT [a]
03E8 - 03EF	COM port [a]
03F2 - 03F7	Floppy
03F8 - 03FF	COM1 port [a]

a. Via setup three address ranges can be defined for the parallel interfaces and four address ranges for the serial interfaces.

b. Used for onboard programmable options. They are not intended to be used from normal users. For more explanation please check the 'Board Specific Hardware Programmer's Manual'

Plug and Play Devices

See 'Board Specific Hardware Programmer's Manual'

Interrupts

The interrupt routing for standard components such as COM1/2 or LPT1 is in compliance with standard PC/AT systems. Unused interrupts can be used for add-on cards or other board specific PCI devices such as SCSI and Ethernet.

Table 20: Interrupt assignments

Hardware IRQ	IRQ Source
INTC1	
IRQ00	System Timer
IRQ01	Keyboard
IRQ02	Cascade from INTC2
IRQ03	COM2 / COM1 [a]
IRQ04	COM1 / COM2 [a]
IRQ05	LPT1 [a] / PnP/PCI [b]
IRQ06	Floppy Disk Controller
IRQ07	LPT1 [a] / PnP/PCI [b]
INTC2	
IRQ08	Real Time Clock
IRQ09	Power Management Contr./PCI [b]
IRQ10	PnP/PCI [b]
IRQ11	PnP/PCI [b]
IRQ12	PS/2 Mouse [c]
IRQ13	Numeric Coprocessor
IRQ14	Rear EIDE [d]
IRQ15	Onboard EIDE [e]
NMI	Parity Error, ECC Error, System Error

[a]. This interrupt is available when no Interrupt Service Routine is installed.
[b]. Interrupts are available for Plug and Play PCI devices
[c]. This interrupt is available when PS/2 mouse is not connected.
[d]. This interrupt is available when the primary EIDE is disabled in SETUP.

[e]. This interrupt is available when the secondary EIDE is disabled in SETUP.

APIC Controller

The Cx9 supports also the Interrupt handlings with APIC (Advanced Interrupt Controller). This handling of the APIC interrupt services must be supported by the operating system. The I/O APIC handles interrupts very differently than the 8259. Briefly, these differences are:

- **Method of Interrupt Transmission.** The I/O APIC transmits interrupts through a three wire bus, and interrupts are handled without need for the processor to run an interrupt acknowledge cycle.
- **Interrupt Priority.** The priority of interrupts in the I/O APIC is independent of the interrupt number. For example, interrupt 10 may be given a higher priority than interrupt 3.
- **More Interrupts.** The I/O APIC in the Intel ICH4 supports a total of 24 interrupts.

For a complete operation description please refer to the ‘Intel ICH4 I/O Controller Hub’ datasheet.

CHAPTER 7 Function Blocks

Chapter Scope

This section gives a brief overview of the software interfaces of onboard devices on the Cx9 CompactPCI Single Board Computer.

Processor

The Intel Pentium M processor family provides high performance with low power and features Enhanced Intel SpeedStep® technology which provides the ability to dynamically adjust the power and performance of the processor based on CPU demand. This results in optimal performance without compromising the power performance of the Cx9.

The processor die is thermally protected by two thermal monitor features. When reaching a maximum safe operating temperature the Thermal Control Circuit in the processor activates a throttling feature and reduces the voltage and frequency dynamically. If this feature is active the Cx9 will indicate it with short clicks at the speaker. In case of a catastrophic die overheating (above 125 °C) the Cx9 switches off the processor core voltage. Recovery from this catastrophic event can be done with a power off-on cycle only.

Memory Controller

The memory controller in the Cx9 supports double data rate synchronous DRAM (DDR SDRAM) with a data bus width of 64 bits + ECC. One, two or four banks are provided by the Cx9 with a size of either 256 MBytes or 512 MBytes. This results in a minimum memory size of 256 MBytes and a maximum size of 2 GBytes.

DMA Controller

In standard AT compatible PCs, as well as on the Cx9, the two DMA controllers integrated on the board are internally cascaded. Both controllers are compatible with the Intel 8237A. The DMA Controller 1 (DMAC1) is

used for byte-wide transfers while the DMAC2 is used for word-wide transfers.

Interrupt Controller

The Interrupt controller on a standard PC consists of two 82C59A devices with eight interrupt request lines each. The two controllers are cascaded so that 14 external and two internal interrupt sources are available. The master interrupt controller provides IRQ [7...1], the slave interrupt controller provides IRQ [15...8]. IRQ2 is used to cascade the two controllers, IRQ0 is used as a system timer interrupt and is tied to interval timer 1, counter 0. The remaining 14 interrupt lines are mapped to various onboard devices. Each 82C59A provides several internal registers. The interrupts at the IRQ input lines are handled by two registers, the interrupt request register IRR and the in-service register ISR. For programming details see the 82C59A data sheet. The Cx9 supports also the Interrupt handlings with APIC (Advanced Interrupt Controller). This handling of the APIC interrupt services must be supported by the operating system. The I/O APIC handles interrupts very differently than the 8259.

Timer

Standard PCs like the Cx9 are equipped with an 8254 compatible timer. This timer contains three counters. Each counter output provides a key system function. Counter 0 is connected to interrupt controller input IRQ0 and provides a system timer interrupt for time-of-day, floppy disk timeout and other system timing functions. Counter 1 generates a refresh request signal and Counter 2 generates the sound for the speaker.

The following table gives an overview over the 8254 functions.

Table 21: Interval timer functions

Interval Timer Functions	
Function	Counter 0 (System Timer)
Gate	Always on
Clock In	1.193 MHz (OSC/12)
Out	IRQ0 (INT1)
Function	Counter 1 (Refresh Request)
Gate	Always on
Clock In	1.193 MHz (OSC/12)
Out	Refresh Request
Function	Counter 2 (Speaker Tone)
Gate	Programmable via Port $061
Clock In	1.193 MHz (OSC/12)
Out	Speaker

The counter/timers are programmed by I/O accesses. A single control word register controls the operation of all three counters. For more information on programming and a detailed register description see the 8254 data sheet.

Real Time Clock

The RTC is a low-power clock that provides a time-of day clock and a 100-year calendar with alarm features and battery backed operation. The time-of-day function includes 14 control registers. Other features include maskable interrupt sources and 242 bytes of general purpose CMOS RAM used by system BIOS. Valid RAM data and time can be maintained after power down through the use of an external battery source. The RTC is software compatible to the Dallas DS1287 and the Motorola MC146818.

Keyboard and Mouse Controller

The communication between the PC and the keyboard is managed by a device compatible with the Intel 8042 microcontroller. This also provides the PS/2 mouse interface.

EIDE Interface

The Cx9 offers two independent EIDE/ATAPI interfaces. Both channels are logically connected to the primary PCI bus. Therefore a high data transfer rate is achievable. The signals of the secondary EIDE interface are used for connection of a 2,5" HDD or flash disk via connector P1800 on board. The signals of the primary EIDE interface are available at the backpanel IO connector only. The Cx9 System BIOS automatically detects a connected EIDE HDD or flash disk and enters the corresponding drive parameters into the BIOS setup. This feature allows faster and easier handling of varying types of EIDE hard disks. At the primary EIDE interface two hard disks can be connected. In this case one HDD must be configured as the master and the other one as a slave. Read the hard disk manual to find out where these jumpers are located on your drive. The optional 2,5” onboard disk is connected to an onboard EIDE connector (secondary EIDE interface).

Using EIDE and SCSI devices: MS-DOS 6.22 can handle up to seven hard disks. The PC allows the simultaneous use of EIDE and SCSI hard disks. BIOS setup allows reordering drives to boot from either SCSI or EIDE drives.

Please note:
For correct operation of the EIDE interface, a maximum cable length of 12 inches (30 cm) must not be exceeded. For use with fast transfer rates such as UDMA 66 and higher a high density 80-pin cable must be used. The use of round wired cables is not recommended.

USB Interface

The Cx9 has five USB 2.0 channels. They are backward compatible to USB 1.0/1.1. The USB host controller supports legacy Keyboard/Mouse usage with USB–based keyboard and mouse without using additional software drivers.

Serial Interface

The Cx9 serial ports are fully compatible with the NS16450 and NS16550. This means that each serial interface provides a 16 byte FIFO and therefore offers a higher performance than earlier used standard serial interfaces. The UARTs have programmable baud rate generators capable of 50 to 115200 baud. There are four address locations defined for serial interfaces on standard PCs. The two serial interfaces are I/O mapped and can occupy four address ranges.

Parallel Interface

The parallel port is fully compatible with the new IEEE 1284 standard, including level 2 support. The parallel ports consist of an Enhanced Parallel Port (EPP1.7/1.9) and an Extended Capabilities Port (ECP 16-Byte FIFO + DMA support). The new modes allow higher transfer rates up to 1 MByte/s. Via BIOS Setup, the operating modes of the parallel interface can be selected. The following modes are supported:

Table 22: Parallel interface options

Mode	Average transfer rate	Average transfer rate
	Read	**Write**
Standard	100 kBytes/s	200 kBytes/s
EPP	1 MByte/s	1 MByte/s
ECP	1 MByte/s	1 MByte/s

On a standard PC, three address areas are defined for a parallel interface. The parallel interface is I/O-mapped and can occupy three address ranges. The address range $3BC cannot be used with EPP operation.

Floppy Controller

The Cx9 floppy controller is fully compatible with the PC8477, containing a superset of the NEC uPD72065B and the N82077AA. The floppy controller uses various I/O addresses in the PC I/O address space.

Graphics Controller

The Graphic Controller NVIDIA® GeForce™ 4 420 Go used in versions 2.x has the following features:

- Highly integrated Flat Panel and CRT GUI
- Max. pixel clock 350 MHz
- Dual Independent Display for CRT front and CRT/Flat Panel rear
- CRT resolution up to 1600x1200, DVI up to 1024x768

The Graphic Controller ATI Mobility™ Radeon™ used in versions 3.x has the following features:

- Highly integrated Flat Panel and CRT GUI
- Max. pixel clock 400 MHz
- Dual Independent Display for CRT front and CRT/Flat Panel rear
- CRT resolution up to 1600x1200, DVI up to 1024x768

Software Installation

Since the NVIDIA and ATI graphic chips are used on a large number of computers, many operating systems like Windows 2000, Windows XP and Linux Suse 9.1 already include high resolution drivers. The Technical Product Information CD-ROM supplied with the Cx9 includes the most commonly used software drivers and utilities.

PMC Interface

The PCI Mezzanine Card (PMC) Interface is an additional slot for parallel mounted expander or option cards. Please see chapter ‘PCI Mezzanine Card (PMC)’ on page 99 of this manual for further details. The Cx9 PMC Connector interface is described on page 94.

IPMI (CT9)

A Baseboard management controller (BMC) is implemented on the CT9, the interfacing between host processor and the system management network. This controller can also work as a Peripheral management controller (PM). The BMC is mapped into the local CPUs I/O address space, specified in the ‘CR9, CT9, CP9, VR9, VP9 Board Specific Hardware Programmer’s Manual’. The functionality of the IPMI controller is described in the ‘Intelligent Platform Management Interface for CT9 User’s Manual’.
For information about the System Management in CompactPCI systems, please refer to the PICMG 2.9 specification 'System Management Specification'. More information about IPMI can be found on the Intel website.

IPMB

The Intelligent Platform Management Bus (IPMB) is an I2C-based bus that provides a standardized interconnection between different CPCI-boards within a chassis. The standardized connection to the backplane is shown below:

Table 23: IPMB backplane pin assignments

J7001	Name	Description
B17	IPMB_SCL	Serial Clock
C17	IPMB_SDA	Serial Data
A4	IPMB_PWR	Power Supply for all IPMI-devices

Private I^2C

The Private IPMI I^2C bus is equivalent to the onboard SMBus (described in 'Additional devices/SMB'). The IPMI-controller works as a second Master on the I^2C bus to read the SMBus devices.

Software Installation

The Technical Product Information CD-ROM supplied with the CT9 includes the most commonly used software drivers and utilities.

Ethernet Interface

The Ethernet controller 82546GB from Intel used with the Cx9 is a high performance dual Gigabit Ethernet 10/100/1000 Mbit PCI controller. Both channels are available on the Cx9. Front or rear Ethernet can be selected via order.

For registration and identification of a workstation in a LAN, a unique ID number is required. Each network card is assigned a unique ID number, which resides in an Ethernet address ROM on the Cx9. An Ethernet boot option can be enabled in BIOS setup.

Software Installation

The drivers available for the Ethernet controller 82546GB support a large number of operating systems. The table shows operating systems supported by the available software:

Table 24: Supported operating systems

Type	System
ODI	DOS, VxWorks
NDIS	DOS, Linux
NDIS	Windows NT 4.0, 98, 2000, XP

The Technical Product Information CD-ROM supplied with the Cx9 includes the most commonly used software drivers and utilities.

Additional devices

Hot Swap

The PICMG 2.1 Hot Swap compliant Cx9 allows the orderly insertion and extraction under power, without adversely affecting system operation. According to the PICMG 2.1 Hot Swap specification, the Cx9 uses its 2.7 k pull-up resistors for biasing purposes during hot insert. During this phase all CPCI signals are pre-charged to 1.1 V with these 2.7 k resistors.

The Hot Swap process can be described in terms of three processes:

Physical Connection Process - describes the acts of:

- Hot Insertion - by which Cx9 is installed in a live system (as a non-system CPU)
- Hot Extraction – which means the Cx9 is removed from a live system (as a non-system CPU)

- Hardware Connection Process - Power Up/Down of the Cx9 onboard voltages
- Software Connection Process - Connection/disconnection of the software layer(s)

At the end of the Physical Connection Process (the shortest Pin has connection) the Hot Swap controller powers up the onboard voltages in a defined manner.
After the handle switches are closed, the CPCI bridge generates an insertion event, which signals a Hot Swap insertion to the system. The system then scans the CPCI-bus for changes.

Please note
The CPCI backplane must support this function and appropriate software must be installed for Hot Swap to work properly.

SMBus devices

The Cx9 uses a serial 2-wire I2C bus to communicate with several onboard devices:

Table 25: SMBus devices

Device	Designators	SMBus address a
Clock synthesizer *	U1000	1101 001Xb
User Serial EEprom (24C04)	U1980	1010 00XXb
Optional big User EEprom	U1983	1010 010Xb
SPD EEprom Bank 0 *	U1981	1010 100Xb
SPD EEprom Bank 1 *	U1981	1010 101Xb
Factory EEprom *	U1984	1010 11XXb
Temperature sensor LM83	U1982	0011 001Xb
Temperature sensor LM75-1	U1985	1001 110Xb
Temperature sensor LM75-2	U1986	1001 111Xb
Analog Digital Converter	U1953	1001 000Xb
IPMI Controller	U8000	0010 XXXXb
Northbridge E7501	U1300	0011 000Xb
Southbridge ICH4 (slave)	U1600	1000 100Xb
PCI Bridge P64H2 *	U6000	1110 011Xb

Devices marked by * are handled by BIOS. It is strongly recommended not to access these devices by user software.
An X at bit 0 represents the R/#W bit.

SMBus external (IPMB)

The Intelligent Platform Management Bus (IPMB) is available on the J7002 CPCI connector for external use. External access via IPMB to the onboard SMBus devices can only be done via the IPMI controller. For more

information please see the IPMB description on page 69 within the IPMI controller section.

Temperature Sensor LM83

A National Semiconductor LM83 temperature sensor is implemented on the Cx9 board. The sensor is located close to the CPU and shows the die-temperature of the CPU and the local onboard temperature. The sensor has an over-temperature output integrated, which can be used to take actions like reducing the CPU speed. For programming information please see the 'AMI-BIOS for CR9, CP9, CT9 User's and Programmer's Manual'.
More information on the LM83 can be found in the data sheet from National Semiconductors.

Temperature Sensors LM75

Two LM75 temperature sensors from National Semiconductors are implemented on the Cx9 board. The first sensor shows the average between the air temperature below the heatsink and the PCB temperature in the CPU area. With the second LM75 the air temperature across the CPCI bridge and the Ethernet controller can be read. This reading is also influenced by the PCB temperature is measured below the heatsink.

Serial EEPROM

For storage of user data a serial EEPROM is implemented on the Cx9 board.. The user EEPROM is a 24C512 type with 64 kByte. More information about writing and reading the contents can be found in the data sheets from the manufacturer (e.g. Microchip Technology, SGS Thomson, Atmel, Catalyst and many others).

Power Management Event

A Power Management Event can be initiated on Cx9 by one of the following events.

Table 26: Power management events

Event	Description
ENUM	Wake Cx9 [a] if a non-system board is removed or inserted
REMOVE	Wake Cx9 if user wants to remove this Cx9
Wake on LAN	Wake Cx9 by Ethernet event
Wake on IO	Wake Cx9 by IO-device i.e. Modem, KB, MS, etc.

[a]. Cx9 in System slot

INTP, INTS

The INTP and INTS signals (PICMG2.0) are available on the J7001_D4/E4. For Cx9 in System Slot, the high active INTP is used as a steerable interrupt which is routed to any legacy ISA interrupt. In Peripheral Slot, INTP can be

generated to trigger an interrupt in the system board. The corresponding interrupt for INTP is selectable via BIOS Setup.

Please note:
Only one peripheral board is allowed to use INTP.

For Cx9 in System Slot, the INTS signal can be used as serialized interrupt, in compliance with the ‘Serialized IRQ Support for PCI Systems’ specification, Rev. 6.0. INTS is synchronous to the PCI clock and has the requirement of meeting the PCI specification.

ENUM#

ENUM (PICMG 2.0, open-collector) is available on J7001_C25. This signal is be driven by Hot Swap compatible boards after insertion and prior to removal.
For Cx9 in System Slot, the input ENUM is able to generate an interrupt to force the software to interrogate all boards within the system for resource allocation regarding I/O, memory and interrupt usage.
If the Cx9 works in a peripheral slot, the non-transparent bridge generate the output ENUM conform to the specification of a Hot Swap compliant board.
For programming information about this PnP device, please see the 'AMI-BIOS for CR9, CP9, CT9 User’s and Programmer’s Manual'.

Geographic Addressing

If the backplane supports geographic Addressing, the Cx9 can detect the unique Address in a CPCI-System with the GA [4...0] pins (PICMG 2.0) on J7002.
For programming information please see the 'AMI-BIOS for CR9, CP9, CT9 User’s and Programmer’s Manual'. For more information about geographic addressing in appliance to system management, see PICMG 2.9.

GPIO (0...7)

Eight GPIO pins are available on J7004. These pins can be used for I/O functions with output 3.3 V signals as well as 5 V tolerant inputs.
For more information please see the ‘Board Specific Hardware Programmer’s Manual’.

Watchdog

For security of application software, the Cx9 offers a software controlled hardware two stage watchdog with independent count values for each stage. First stage generates an INT or SMI. The second stage issuing a reset signal if its time-out interval expires. The configurable granularity reaches from 1µs to 10min.
For more information please see the Intel ICH4 I/O Controller Hub datasheet and the ‘Board Specific Hardware Programmer’s Manual’.

Programmable Timer

An additional programmable Timer is implemented on the Cx9. The timer can generate an Interrupt.

For more information please see the ‘Board Specific Hardware Programmer’s Manual’.

LEDs

Two LED’s are available at the front panel green/red and blue.
The Status LED is a green/red bi-color for BIOS power-up status indication, after boot loading the user software is free to use this LED for it’s own purpose.

Table 27: BIOS power-up status

Status	LED color
Power-up, still Reset state	Red on (also the blue LED is on)
BIOS early init	Blink red 1Hz
BIOS start POST	Blink amber 1Hz
BBIOS POSTA init	Blink green 1Hz up to 4Hz
OS boot	Green on
System halted or reset	Red on

The blue LED is the Hot Swap LED and is working according the Hot Swap specification.

Reset Button

There is a Reset Button onboard. An external Reset button may be connected between the appropriate IO connector at the back side and GND. The PRST# on J7002_C42 (PICMG2.0) is used as Reset input only for the system board and is in this case, compatible to the onboard button.

- If the Cx9 works as a System board:
  The push button will issue a hard power-on reset. The reset signal is active for all subsystems of the Cx9.
- If the Cx9 works as a Peripheral board:
  1) The push button will issue a hard power on reset. The reset signal is active for the Cx9 including PMC modules, but will not reset other peripherals or the System board.
  2) The Cx9 will signal a Hot Swap Insertion event when reset.

Speaker

An internal speaker is implemented on the Cx9 except on a CR9 N-Style (or 8-style). An external standard PC compatible speaker may be connected between the appropriate IO connector at the backside and +5 V.

CHAPTER 8 Specifications

PCB

FR4 Multilayer

Size

Total board size: 6U, 4 HP (CR9 and CT9)
Total size with optional extension board 8HP (CP9)

Dimensions

PCB: 233.35 mm x 178 mm x 20 mm (CR9 and CT9 single slot)
PCB: 233.35 mm x 178 mm x 40 mm (CP9 dual slot)

Mechanical Incompatibility

There is an incompatibility in terms of component height on the Cx9 boards close to the P3 connector (CompactPCI). **The Ethernet transformer is slightly higher than the height envelope of the respective specification allows.** This is to be checked when planning to insert a PMC mezzanine module in the center of a 6U board (PMC1). If no PMC is inserted into this mezzanine slot then there is no mechanical height violation.

Weight

Approx. 650 g (with front panel, HDD and heat sink),
Depending on model and style

RoHS compliance

Version 2 of Cx9 is only available in Non-RoHS
Version 3 of Cx9 is available in Non-RoHS and RoHS

Power Consumption

The following table is intended to help you calculate the power consumption of a Cx9 system. For measurement, the Cx9 board is mounted on a CPCI backplane. During measurement, the power consumption of the backplane, keyboard and the hard disk drive are withdrawn from the results. The values are typical measured. The current drawn from +5 V supply the CPU and all external devices. The 3.3 V supply all other components on the Cx9**.**

Table 28: Power consumption CPU dependent

Cx9	DOS prompt without Power management, CPU die around +50 °C*	DOS CPU running full cache access, CPU die around +50 °C*	Windows XP, CPU running a maximum power consumption instruction mix at +100 °C die temperature
	+5 V	**+5 V**	**+5 V**
Pentium M 600 MHz 130 nm	0.7 A	0.9 A	0.9 A
Celeron M 1.0 GHz 90 nm **	0.7 A	0.9 A	0.9 A
Pentium M 1.1 GHz 130 nm	1.2 A	1.6 A	2.3 A
Pentium M 1.4 GHz 90 nm **	1.2 A	1.6 A	2.3 A
Pentium M 1.6 GHz 130 nm	2.7 A	3.5 A	5.4 A
Pentium M 1.8 GHz 90 nm	2.5 A	3.0 A	4.5 A
Celeron M 1.3 GHz 130 nm	2.2 A	2.6 A	4.6 A

* for every 25 °C more please add around 10 %
** estimated values

Table 29: Power consumption DRAM dependent

Cx9	DOS prompt or CPU running full cache access, mid range temperature	BIOS POST during memory initialization	Windows XP, 3D graphics active, both Gigabit Ethernet channels linked
	+3.3 V	**+3.3 V**	**+3.3 V**
256 MB (1 bank, 9 devices)	4.9 A*	5.8 A*	6.2 A
512 MB (2 banks, 18 devices)	5.2 A*	6.2 A*	6.7 A
1 GB (4 banks, 36 devices)	5.9 A*	7.1 A*	7.5 A
2 GB (4 banks, 36 devices)	5.9 A*	7.1 A*	7.5 A

* for every Ethernet channel linked to gigabit please add 0.55A
The exact values may vary with different dram vendors by +/- 20 %

- When using onboard PMC modules don't forget to add their power consumption
- With an onboard hard disk drive please add following values to the +5 V current:
  - During power up 0.9 A max.
  - In an idle condition 0.13 A typical.
  - During read/write access 0.42 A typical

  Values are taken from the Fujitsu MHT 2060 AT datasheet
- With an onboard compact flash drive please add 0.1 A to the +5 V current
- For keyboard, mouse, etc. please add 0.1 A (typical) to the +5 V current
- Connectors P1680, P2001, and P4200 provide fused VCC voltage (+5 V). The total current drawn from this source may not exceed 1.0 A

Onboard Lithium Battery

BR1225, estimated life time depending on temperature and power status:

Table 30: Lithium battery parameters

Temperature	Cx9 powered	Cx9 power off
<=35 °C	120 month	24 month
+50 °C	100 month	12 month
+70 °C	80 month	6 month
+85 °C	60 month	3.5 month

With the values from the table above, it should be possible to calculate the battery lifetime based on the used power on/off ratio.
The battery has a user accessible holder on the Cx9.
If exchanged by customer, please use same type for replacement and ensure correct polarization.
For operating without battery please check the following description of the external battery input.

External Battery Input

VBATIN input ranges 2.4 to 3.3 V, max. Current (@ 3.0 V; 35 °C) 5 µA

Without an onboard battery it is recommended to use an external supply connected to this input. This voltage supplies the real time clock and the CMOS RAM for storing the BIOS Setup settings.
Without battery and without this supply voltage, the real time clock oscillator has to be started at each power up. This time gets longer when operating at lower temperatures and can be up to around 30 seconds (at -40 °C). At normal ambient temperatures this delay is below one second.

The red status LED goes off after the reset sequence and starts its normal blinking within the BIOS POST after the RTC oscillator is up.
When ordering a battery-less CR9, the setup information is stored automatically within an onboard EEPROM and is updated via standard BIOS Setup function. No external software is needed to create a user defined setup like in earlier products from SBS Technologies. It is still recommended to use an external supply voltage to this battery input to avoid the power on oscillator start time and to keep the date and time information.

Environment Conditions

Ambient temperatures and humidity values for the Cx9:

Table 31: Environment conditions

	C-, D-, 1-, 2-Style	I-, H-, R-, N-, 3-, 4-, 6-, 8-Style
High Temperature		
- Storage (see note below)	+85 °C	+85 °C
- Operating (see diagram below)		
Low Temperature		
- Storage (see note below)	-40 °C	-40 °C
- Operating	0 °C	-40 °C
Temperature Shock		
- Storage	+/-10 °C/min	+/-20 °C/min
- Operating	+/-5 °C/min	+/-10 °C/min
Relative Humidity		
- Storage, Operating	Up to 95 %, non-condensing	

CT9 and CP9 only support C-, 1- and I-, 3-style
Storage temperature on R-, N- or 6-, 8-style is between -55 °C (low) and +105 °C (high).

Shock and vibration values for the Cx9:

Table 32: Shock & vibration parameters

	C-, D-, I-, H-, 1-, 2-, 3-, 4-Style	R-, 6-Style	N-, 8-Style
Vibration			
- Spectrum	5 to 100 Hz	5 to 2000 Hz	5 to 2000 Hz
- Acceleration	2 g rms	2 g rms	14 g rms
Shock			
- Amplitude	12 g	20 g	40 g / 100 g
- Duration	6 ms	6 ms	11 ms / 6 ms

CT9 and CP9 only support C-,1- and I-, 3-style

Maximum height usage

Table 33: Maximum height usage

	C-, D-, I-, H-, R-, 1-, 2-, 3-, 4-, 6-Style	N-, 8-Style
Maximum height		
- Operating	4.5 km	Vacuum
- Storage	12 km	Vacuum

Only the N-, 8-style board is capable to be used in a vacuum environment. All other styles contain either batteries and do not have the possibility to be cooled without airflow.

For highest operating temperatures (C-, D-, I-, H-, R-, 1-, 2-. 3-. 4-, 6-Style) please refer to the following diagram:

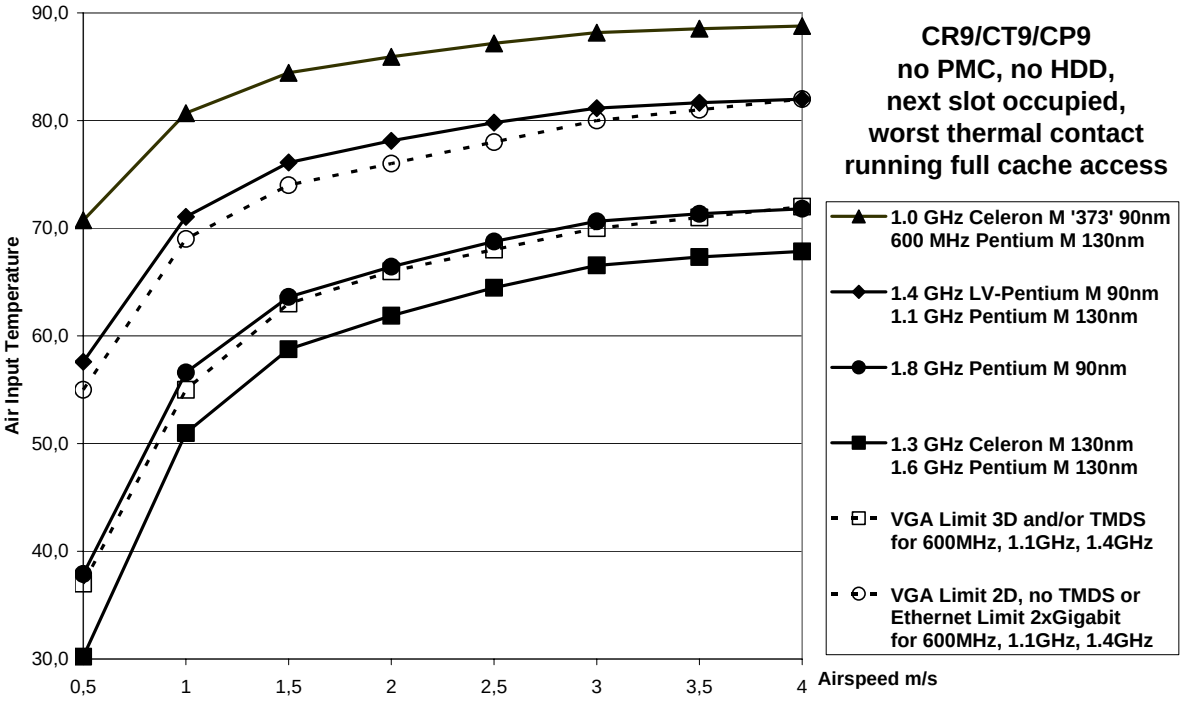

Figure 19: Temperature vs. airspeed

- 0.5 m/s airflow means convection cooled only with free airflow. This is the minimum required airflow for the Cx9.
- The core temperature of the CPU can be read out via the onboard temperature sensor. The value must be kept below 100 °C for all operating conditions. This value is already included in the airspeed diagram above. If this temperature limit is violated, the Pentium CPUs will start to reduce its internal frequency temporarily. This can be heard by a short click of the speaker which occurs every 0.8 seconds. The Celeron processor will not automatically switch down to lower frequencies but will stop its internal clock in preprogrammed intervals.
- In the diagram above you can find two temperature limits. One shows the maximum operating temperature when using graphics with 3D

applications or the TMDS interface. The other shows the limit with the graphics option mounted or when using the Ethernet interface with both channel in Gigabit mode. For Fast Ethernet (100 Mbit). This limit needs not to be taken into consideration. Both limits are valid with the low power CPUs running at 600 MHz or 1100 MHz. For higher CPU frequencies, the maximum operating temperature is limited by the CPU already.

- When using an onboard hard disk drive (not with flash disk) the operating temperature is limited to 50 °C
- When using one or two PMC modules, please consider their power consumption and thermal limits in calculating the max. operating temperature

For more information on the N-, 8-style version, please check the thermal report document of the CR9.

Electrical Characteristics

The supply voltages are +5 V, 3.3 V, +12 V. The -12 V are required only if needed on the PMC slot. All Output voltages of the Cx9 boards have an over current protection. The maximum current for each voltage is shown below:

Table 34: Power supply parameters

Name	U	Imax	Description	Fuse
+12VIN	12 V	0.5 A	Supply for Hot Swap controller and PMC-Module	U7700 [a]
-12VIN	-12 V	0.1 A	Supply for PMC-Module	U7700 [a]
USB_VCC	5 V	2 A	Supply for front panel USB	F1681 [b]
USBR_VCC	5 V	2 A	Supply for rear USB via transition module	F1680 [b]
FUSE_VCC	5 V	2 A	Supply for front panel I/Os: KB/MS, CRT-DCD	F9001 [b]

[a]. LTC1643L-1CGN (Linear Technologies)
[b]. TPS2034D (Texas Instruments)

Supply voltage range

The following ranges are defined by the CPCI specification PICMG 2.0 Rev 3.0. The voltages have to be measured at the Cx9 board (for example at the CPCI connector pins at the solder side):

Table 35: Supply voltage range

Supply	Voltage and tolerance
+5 V	5.0 V +5 % / -3 %
+3.3 V	3.3 V +5 % / -3 %
+12 V	12.0 V +/- 5 %

GPIO 0...7

This general purpose I/O pins can be used as inputs, with following signal levels:

Table 36: GPIO input voltages

	Signal level
low	-0.5 V ... +0.8 V
high	+2.0 V ... +5.5 V

When used as outputs, the following signal levels are supplied:

Table 37: GPIO output voltages

	Signal level at current
low	-0.4 V at 6 mA sinking
high	+2.4 V at 3 mA sourcing

Electrical clearance

Starting with board version x.y certain rules on spacing between conductors on individual layers of the printed circuit board (PCB) apply. The boards starting with version V3.x are designed to meet the parameters as listed below.

Voltage between conductors (DC or AC peaks) of 51 V – 100 V require a spacing of

- **0.6 mm for type B2 conditions**

external conductors, uncoated, sea level to 3050 m.

These rules are in accordance with IPC-2221 requirements.

Isolation

The Isolation of the Ethernet outputs whether front or rear is limited to 500 V peak against GND and any other supply voltage.

By itself the onboard digital ground GND and the front panel/chassis frame ground FGND are isolated on the Cx9 with a layout distance of more than 0.3 mm in all PCB layers. However, most standard devices (keyboard, mouse, and monitor) except Ethernet will connect FGND and GND directly in the device. Also standard racks (our starter cage too) connect both grounds at the power supply for safety reasons.

Placement Plan Component Side Cx9 V2

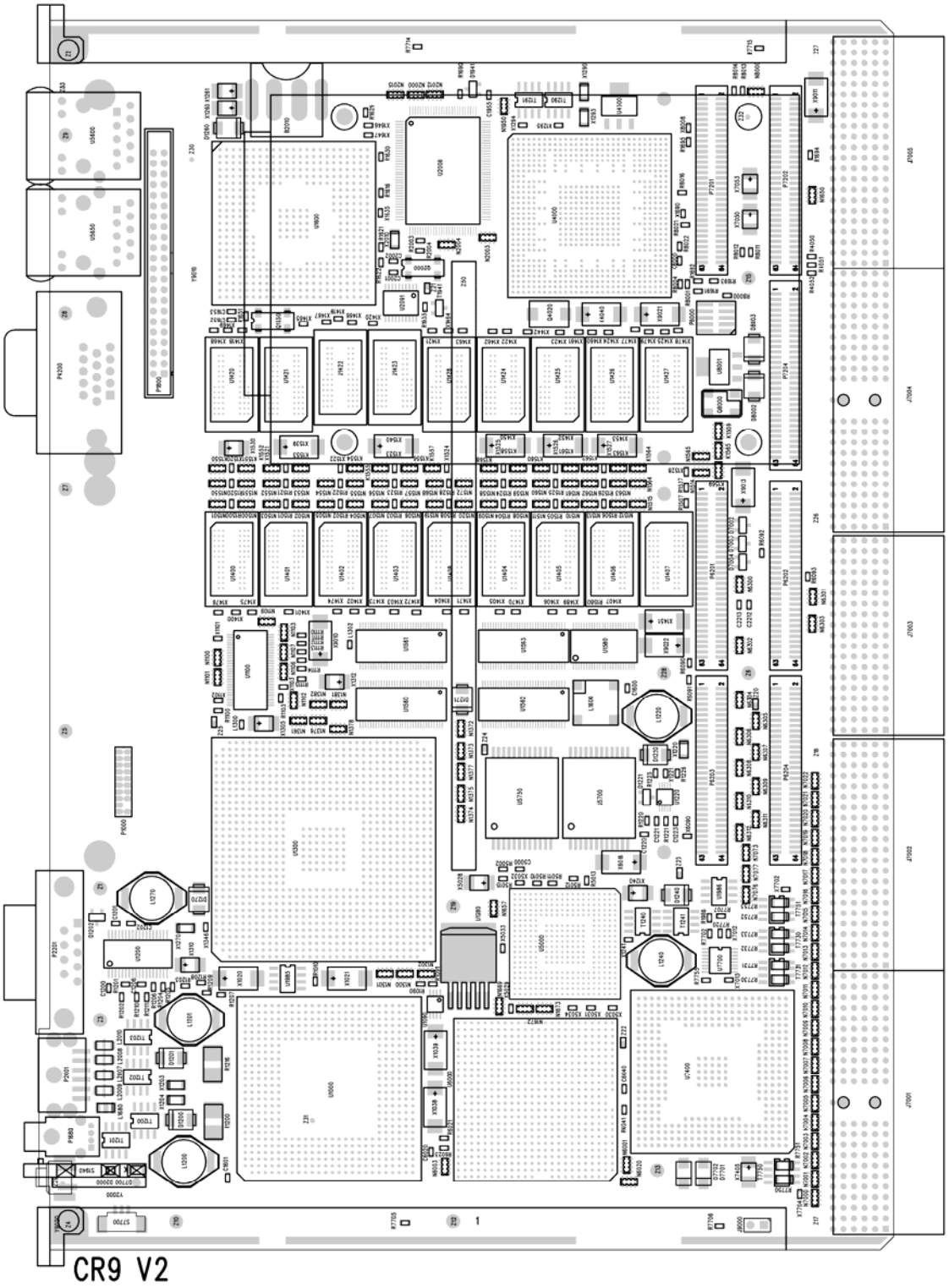

Figure 20: Cx9 V2 component side placement plan

Placement Plan Solder Side Cx9 V2

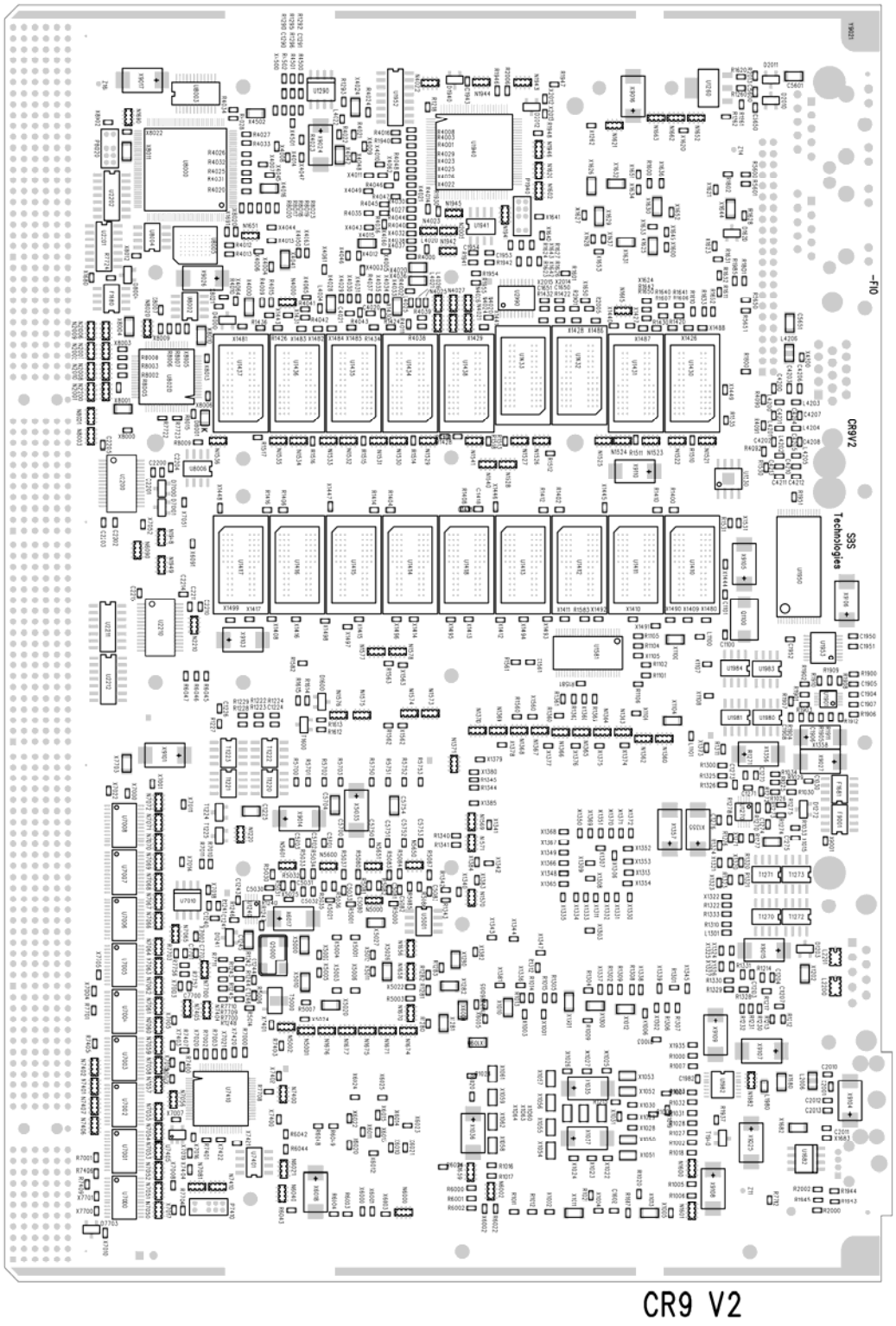

Figure 21: Cx9 V2 solder side placement plan

Appendix A Transition Module CTM12

The CTM12 transition module is used for easy connection of I/O signals to standard connectors.

Please note:
Additional +5 V/+12 V Power must be provided to the CTM12 via P7700 to supply an external EIDE or a 1” high floppy disk drive via the power output P7701. This must be done when the Cx9 is intended to be used as a Hot Swap board for ramping up the external drives after the Cx9 is inserted in the backplane. Without the need for Hot Swap, the external drives may be connected direct to the power supply and P7700 and P7701 need not to be connected except the +12 V from P7700 for the PIM connectors P7100/P7200 are needed.

Please note:
You either can use a DVI display on P4100 or a standard VGA Monitor/Display connected to P4001 or a standard VGA Monitor/Display via a DVI-to-VGA adaptor connected to P4100. You never can use two display devices connected to the transition module. If you want to have two display outputs, you will have to connect one to the front of the Cx9 and one to the rear/transition module.

Please refer to the drawing for the location of available interfaces:

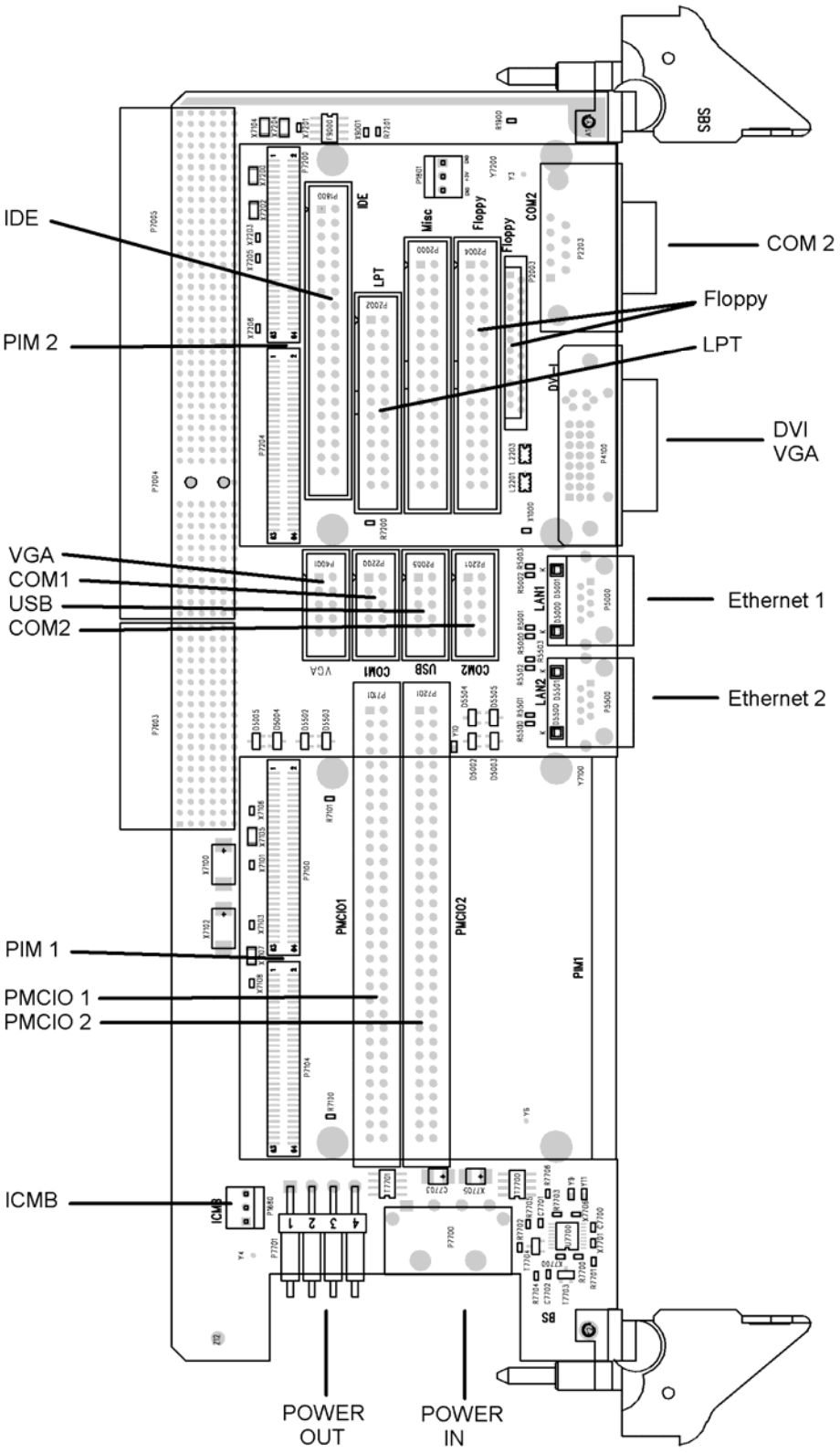

Figure 22: CTM12 component locations

CTM12 Interfaces

This chapter describes all connector pinouts on the CTM12 transition module.

EIDE Connector P1800

The IDE interface is designed as a 40-pin 2.54 mm pitch male connector to connect directly to one or two external EIDE hard drives. The cable length must not exceed 30 cm. It is recommended to use an 80-pin high density cable for UDMA 3 and higher transfer.

Table 38: CTM 12 EIDE connector

Name	P1800		Name
GND	2	1	\RST_DRV
HD_D8	4	3	HD_D7
HD_D9	6	5	HD_D6
HD_D10	8	7	HD_D5
HD_D11	10	9	HD_D4
HD_D12	12	11	HD_D3
HD_D13	14	13	HD_D2
HD_D14	16	15	HD_D1
HD_D15	18	17	HD_D0
NC	20	19	GND
GND	22	21	HD_DRQ0
GND	24	23	\HD_IOW
GND	26	25	\HD_IOR
NC	28	27	HD_RDY
GND	30	29	HD_DAK0
NC	32	31	HD_IRQ
NC	34	33	HD_A1
HD_A2	36	35	HD_A0
\HD_CS3	38	37	\HD_CS1
GND	40	39	NC

Ethernet Interface 10/100/1000BaseT P5000 and P5500

The Ethernet interfaces for Rear-IO requires usage of CAT 5 cable for proper operation with 100/1000BaseT.

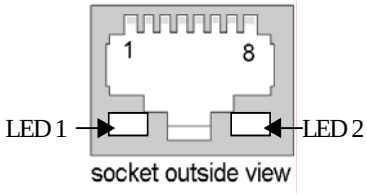

Figure 23: CTM12 Ethernet connector layout

Table 39: CTM12 Ethernet connector pin assignments

Name 10/100base	Name 1000base	Ethernet1, 2
TxD+	LP_DA+	1
TxD-	LP_DA-	2
RxD+	LP_DB+	3
NC	LP_DC+	4
NC	LP_DC-	5
RxD-	LP_DB-	6
NC	LP_DD+	7
NC	LP_DD-	8

Two LED's (LED1 and LED2) are integrated in each of the RJ45 connector. These LED's indicates the link status of the interface.

Table 40: CTM12 Ethernet connector LED

LED1 green	Function
green	General link
blink green/orange	General link with Rx/Tx activity
LED2 yellow	**Function**
green	Link 100 Mbit
Orange	Link 1000 Mbit

Parallel Interface LPT1 P2002

Table 41: Parallel connector pin assignments

Name	P2002
\Strobe	1
D0	3
D1	5
D2	7
D3	9
D4	11
D5	13
D6	15
D7	17
\ACK	19
BUSY	21
PE	23
SLCT	25
\AUTOFEED	2
\ERROR	4
\INIT	6
\SLCTIN	8
GND	10,12,14,16,18,20,22,24
FUSE_VCC [a]	26

[a] +5 V supplied by the Cx9 and fused with max 2 A at CTM12 for normal operation don't exceed 100 mA at this pin.

Serial Interfaces COM1 P2200 and COM2 P2201/P2203

The Cx9 offers two RS232 serial ports. All COM ports are accessible via the Transition module at 10-pin headers and are software selectable for RS-232 or RS-422/485 operation. The RS485 output drivers can be enabled or disabled with the DTR signal. An active DTR means the drivers to be enabled. When using the RS422 setting the output drivers are always enabled and the DTR signal is not used. COM2 is also available at the rear panel with a 9-pin D-sub connector.

Table 42: COM1/COM2 connector pin assignments

Name RS232	Name RS422/485	COM2 P2203	P2200,2201
DCD	TXD-	1	1
DSR	TXD+	6	2
RXD	RTS-	2	3
RTS	RTS+	7	4
TXD	CTS+	3	5
CTS	CTS-	8	6
DTR	RXD+	4	7
RI	RXD-	9	8
GND	GND	5	9
	FUSE_VCC [a]	-	10

[a] +5 V supplied by the Cx9 and fused with max 2 A at CTM12 for normal operation don't exceed 100 mA at this pin.

VGA Interface P4001

The VGA monitor signals are available on P4100 a 10-pin male header. They are parallel connected with the DVI-I connector P4100. You either can use a DVI display on P4100 or a standard VGA Monitor/Display connected to P4001 or a standard VGA Monitor/Display via a DVI-to-VGA adaptor connected to P4100. You never can use two display devices connected to the transition module. If you want to have two display outputs, you will have to connect one to the front of the Cx9 and one to the rear/transition module.

Table 43: VGA connector pin assignments

Name	P4001
RED	2
GREEN	4
BLUE	6
HSYNC	8
VSYNC	10
GND	1, 3, 5, 7, 9

DVI-I connector P4100

The CTM12 provides a DVI-I connector to connect DVI capable monitors. Both digital and analog video signals are provided. For the digital signals the Transition Minimized Differential Signaling (TMDS) is used. The maximum resolution with a Cx9 is limited to 1024x768.

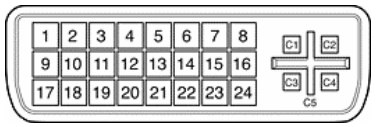

Figure 24: DVI connector layout

Table 44: DVI connector digital pin assignments

Pin	Signal name	Pin	Signal name
1	TX2- (TMDS Data2–)	13	NC
2	TX2+ (TMDS Data2+)	14	FUSE_VCC [a]
3	GND	15	GND
4	NC	16	NC
5	NC	17	TX0- (TMDS Data0–)
6	DDC Clock	18	TX0+ (TMDS Data0+)
7	DDC Data	19	GND
8	VSYNC	20	NC
9	TX1- (TMDS Data1–)	21	NC
10	TX1+ (TMDS Data1+)	22	GND
11	GND	23	TXC+ (TMDS Clock+)
12	NC	24	TXC- (TMDS Clock–)

Table 45: DVI connector analog pin assignments

Pin	Signal name
C1	RED Analog Red Video
C2	GREEN Analog Green Video
C3	BLUE Analog Blue Video
C4	HSYNC Analog Horizontal Sync
C5	GND

[a] +5 V supplied by the Cx9 and fused with max 2 A at CTM12 for normal operation don't exceed 100 mA at this pin.

USB connector P2005

Four channels are available on a 10-pin male header. USBVCC is supplied and controlled by the Cx9 board. It is fused with 2 A, but for normal operation don't exceed 1 A at this pin.

Table 46: USB connector (10-pin header) pin assignments

Name	P2005
USB0-	1
USB0+	29
USB1-	3
USB1+	4
USB2-	5
USB2+	6
USB3-	7
USB3+	8
GND	9
USBVCC	10

Floppy connector P2003/2004

The CTM12 provides a connector for direct adaptation of a floppy drive via a standard 2.54 mm 34-pin connector. For connection to the floppy drive please use a non twisted 34-pin flat cable connected to P2004. Alternatively, you can use a 26-pin foil cable connector (P2003).

Table 47: Floppy connector pin assignments

Name	P2003	P2004
\INDEX	2	8
\DRVSEL	4	12
\DSKCHG	6	34
\MOTOR	10	16
\DIR	12	18
\STEP	14	20
\WRDATA	16	22
\WGATE	18	24
\TRACK0	20	26
\WRPROT	22	28
\RDDATA	24	30
\HDSEL	26	32
GND	15, 17, 19, 21, 23, 25	1, 3, 5, 7, 9, 11, 13, 15, 17,19, 21, 23, 25, 27, 29, 31, 33
FUSE_VCC [a]	1, 3, 5 -	
NC	7, 8, 9, 11, 13	2, 4, 6, 10, 14

[a] +5 V supplied by the Cx9 and fused with max 2 A at CTM12 for normal operation don't exceed 100 mA at this pin.

Miscellaneous connector

P2000 contains miscellaneous signals:

Table 48: Miscellaneous connector pin assignments

Name	P2000		Name
NC	1	2	NC
NC	3	4	NC
GND	5	6	\RST_BUT
FUSE_VCC [a]	7	8	\SPEAKER
FUSE_VCC [a]	9	10	\WDG_REL
FUSE_VCC [a]	11	12	\LED
FUSE_VCC [a]	13	14	MOUSE_CLK
GND	15	16	MOUSE_DAT
FUSE_VCC [a]	17	18	KBD_CLK
GND	19	20	KBD_DATA
FUSE_VCC [a]	21	22	USB1-
USB1+	23	24	USB2-
USB2+	25	26	GND
GPIO1	27	28	VBATIN [b]
GPIO0	29	30	VIO [c]

[a] +5 V supplied by the Cx9 and fused with max 2 A at CTM12 for normal operation don't exceed 100 mA at this pin. [b] VBATIN is used to connect an external battery to Cx9. For description please check the section External Battery Input.
[c] VIO is the I/O voltage of the PMC slot and is connected to +5 V on the CT

PMC I/O connectors

The PMC I/O signals of both PMC slots are either available at 64-pin male headers (P7101/P7201) or via VITA36 compliant PIM (PMC I/O Module) connectors (P7100/P7104 and P7200/P7204). The availability of a PIM interface or 64-pin header is mutually exclusive.

The following table lists the pin assignments of the onboard PIM connectors. The I/O signals from PMC 1 (PMC1IO_xx) are connected to P7104 and the I/O signals from PMC 2 (PMC2IO_xx) are connected to P7204.

Table 49: PMC I/O onboard PIM connector pin assignments

P7100/P7200	P7104/P7204	Pin	Pin	P7100/P7200	P7104/P7204
	PMCxIO_01	01	02	+12 V [b]	PMCxIO_02
	PMCxIO_03	03	04		PMCxIO_04
+5 V [a]	PMCxIO_05	05	06		PMCxIO_06
	PMCxIO_07	07	08		PMCxIO_08
	PMCxIO_09	09	10	+3.3 V [a]	PMCxIO_10
	PMCxIO_11	11	12		PMCxIO_12
GND	PMCxIO_13	13	14		PMCxIO_14
	PMCxIO_15	15	16		PMCxIO_16
	PMCxIO_17	17	18	GND	PMCxIO_18
	PMCxIO_19	19	20		PMCxIO_20
+5 V [a]	PMCxIO_21	21	22		PMCxIO_22
	PMCxIO_23	23	24		PMCxIO_24
	PMCxIO_25	25	26	+3.3 V [a]	PMCxIO_26
	PMCxIO_27	27	28		PMCxIO_28
GND	PMCxIO_29	29	30		PMCxIO_30
	PMCxIO_31	31	32		PMCxIO_32
	PMCxIO_33	33	34	GND	PMCxIO_34
	PMCxIO_35	35	36		PMCxIO_36
+5 V [a]	PMCxIO_37	37	38		PMCxIO_38
	PMCxIO_39	39	40		PMCxIO_40
	PMCxIO_41	41	42	+3.3 V [a]	PMCxIO_42
	PMCxIO_43	43	44		PMCxIO_44
GND	PMCxIO_45	45	46		PMCxIO_46
	PMCxIO_47	47	48		PMCxIO_48
	PMCxIO_49	49	50	GND	PMCxIO_50
	PMCxIO_51	51	52		PMCxIO_52
+5 V [a]	PMCxIO_53	53	54		PMCxIO_54
	PMCxIO_55	55	56		PMCxIO_56
	PMCxIO_57	57	58	+3.3 V [a]	PMCxIO_58
	PMCxIO_59	59	60		PMCxIO_60
-12 V [a]	PMCxIO_61	61	62		PMCxIO_62
	PMCxIO_63	63	64		PMCxIO_64

[a] +5 V, +3.3 V, –12 V nonfused supplied via Cx9, max 1 A for +5 V and +3.3 V, and 100 mA for –12 V

[b] +12 V supplied via the CMT12 external power connector P7700, max current 500 mA

The following table lists the pin assignments of the PMC I/O signals of the 64-pin header.
The I/O signals from PMC 1 (PMC1IO_xx) are connected to P7101 and the I/O signals from PMC 2 (PMC2IO_xx) are connected to P7201.

Table 50: PMC I/O 64-pin header connector pin assignments

P7101/P7201	Pin		P7101/P7201
PMCxIO_01	1	2	PMCxIO_02
PMCxIO_03	3	4	PMCxIO_04
PMCxIO_05	5	6	PMCxIO_06
PMCxIO_07	7	8	PMCxIO_08
PMCxIO_09	9	10	PMCxIO_10
PMCxIO_11	11	12	PMCxIO_12
PMCxIO_13	13	14	PMCxIO_14
PMCxIO_15	15	16	PMCxIO_16
PMCxIO_17	17	18	PMCxIO_18
PMCxIO_19	19	20	PMCxIO_20
PMCxIO_21	21	22	PMCxIO_22
PMCxIO_23	23	24	PMCxIO_24
PMCxIO_25	25	26	PMCxIO_26
PMCxIO_27	27	28	PMCxIO_28
PMCxIO_29	29	30	PMCxIO_30
PMCxIO_31	31	32	PMCxIO_32
PMCxIO_33	33	34	PMCxIO_34
PMCxIO_35	35	36	PMCxIO_36
PMCxIO_37	37	38	PMCxIO_38
PMCxIO_39	39	40	PMCxIO_40
PMCxIO_41	41	42	PMCxIO_42
PMCxIO_43	43	44	PMCxIO_44
PMCxIO_45	45	46	PMCxIO_46
PMCxIO_47	47	48	PMCxIO_48
PMCxIO_49	49	50	PMCxIO_50
PMCxIO_51	51	52	PMCxIO_52
PMCxIO_53	53	54	PMCxIO_54
PMCxIO_55	55	56	PMCxIO_56
PMCxIO_57	57	58	PMCxIO_58
PMCxIO_59	59	60	PMCxIO_60
PMCxIO_61	61	62	PMCxIO_62
PMCxIO_63	63	64	PMCxIO_64

Power connector P1801

This optional 3-pin connector provides +5 V to supply external logic or devices as 2.5” hard drives etc.

Table 51: Power connector pin assignments

Name	P1801
GND	1
FUSE_VCC [a]	2
GND	3

[a] +5 V supply via Cx9 and fused with max 2 A at CTM12. Don't exceed 1 A at this connector for normal operation.

Power IN/OUT connectors P7700, P7701

In case of Hot Swap (insertion or extraction phase) of the Cx9 the CTM12 provides the possibility of switch-off the power to external storage devices. The voltage +5 V and +12 V between power-in P7700 and power-out P7701 controls a Hot Swap controller via MOSFETs. The Hot Swap controller cut the voltage when the signal VCCOFF# is low. VCCOFF is controlled by the Hot Swap at the Cx9. In case of over-current the controller switches off the voltages, too.

Table 52: Power IN/OUT connector pin assignments

Name	Power In P7700	Power Out P7701
+12 V	1	4
GND	2	3
GND	3	2
+5 V	4	1

Over-current threshold:
+5 V 6 A
+12 V 3 A

Placement Plan

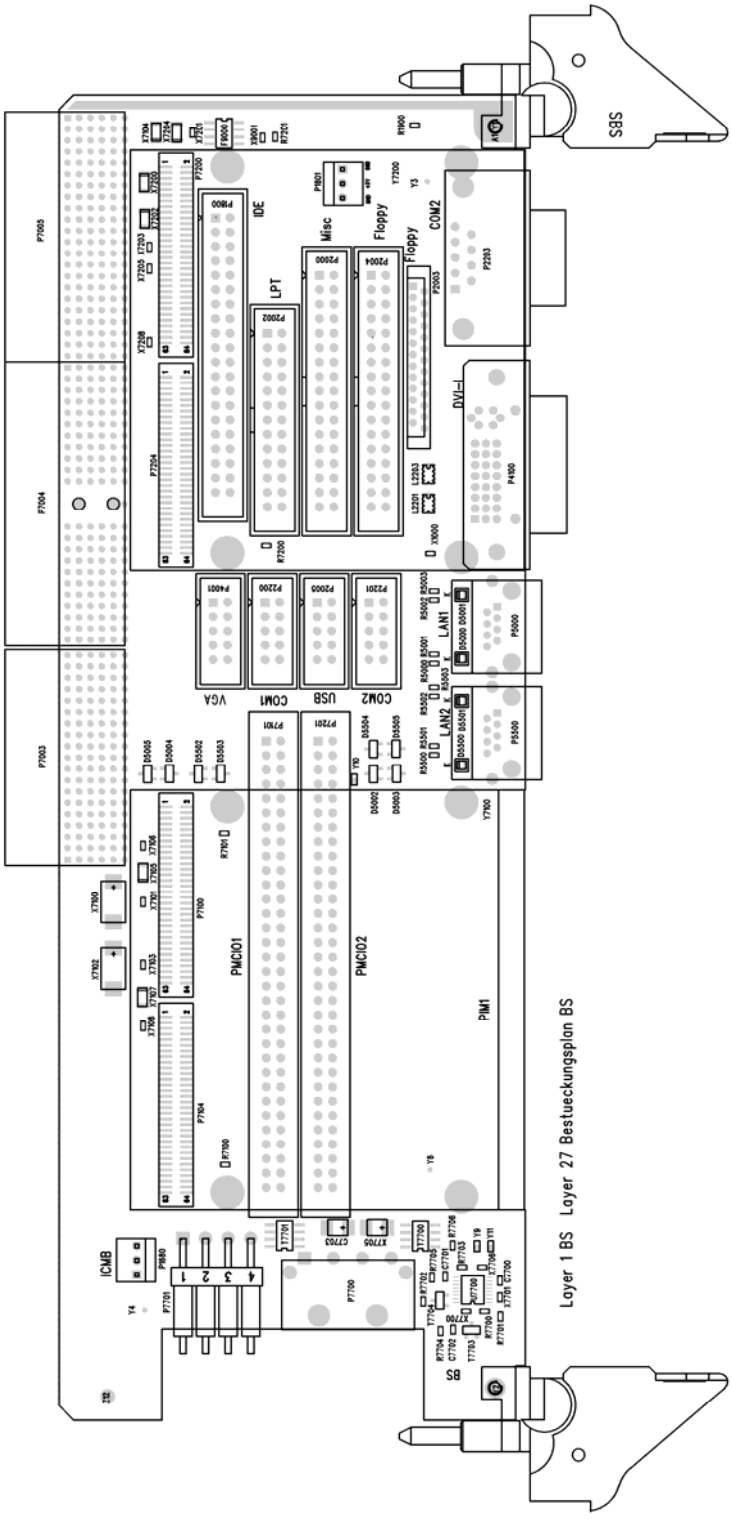

Figure 25: Placement Plan CTM12

Appendix B PCI Mezzanine Card (PMC)

The PCI Mezzanine Card (PMC) Interface is an additional slot for parallel mounted add on cards. The interface is compliant to the IEEE 1386.1 specification and is based on the electrical and logical layer of the PCI specification. Check for possible height incompatibility in 'Features' and 'Specifications' sections of this manual. PMC Slot1 is 66/100/133 MHz PCI-X capable. PMC Slot 2 is 33 MHz/32 bit only. The user definable I/O pins are connected to the rear IO connector on the Cx9, as defined in the PICMG 2.3 specification.

- A 5 V key is mounted on PMC2, for 5 V compatible PMC-Cards.
- A 3 V key is mounted on PMC1, for 3 V compatible PMC-Cards.

Electrical characteristics

Table 53: Electrical characteristics

Parameter	Comment	Value
I3.3V	Max. current on 3.3 V Pins	2.1 A [c]
I5V	Max. current on 5 V Pins	1.2 A [c]
I+12V	Max. current on +12 V Pin	0.1 A
I-12V [a]	Max. current on -12 V Pin	0.1 A
V(I/O) [b]	Voltage for PCI IO	3.3 V or 5 V
P	Max. power consumption total	7.5 W

a) -12 V must be connected to the backplane
b) The appropriate key has to be mounted
c) Total power dissipation on 3.3 V and 5 V rail is 7.5 W

To mount a PMC board to the Cx9, follow these steps:

1. Remove Cx9 from system housing
2. Remove the front panel cover of the PC slot
3. Take PMC from inside through front panel and push connectors together.
4. Verify correct installation of EMC gasket
5. Fix PMC on host boards with the four screws supplied with the PMC card. The screws must be locked with Loctite 243 when using the Cx9 in a mechanical rough environment.

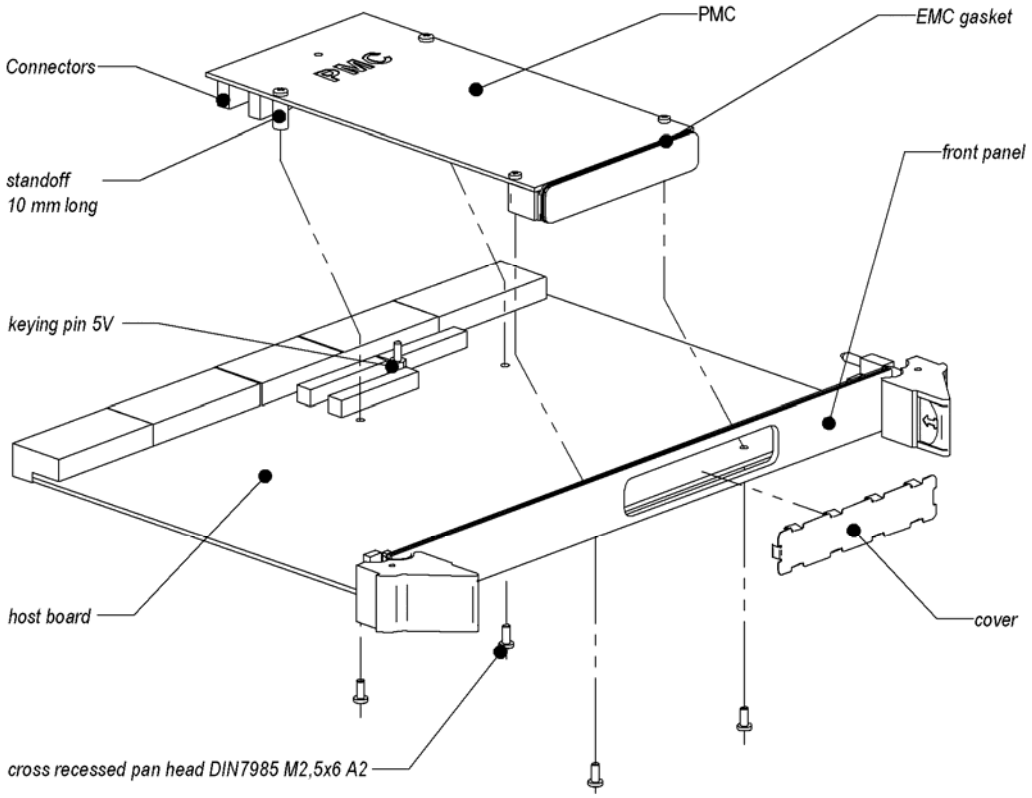

Figure 26: Mount PMC board to Cx9

Appendix C Support, Service And Warranty Information

Chapter Scope

The following sections describes SBS Technologies' product support program. It states our product warranty terms and provides details about what action to take if you experience a problem with the product.

Geographical Regions:

World-wide headquarter of SBS Technologies, Inc. is at

SBS Technologies Inc.
7401 Snaproll St., NE
Albuquerque, NM 87109
U.S.A.

SBS Technologies, Inc. uses two regional headquarters for the purpose of support, service, RMA returns and other functions.

Regional areas:

WW	world-wide
EU	Europe, Russia, Near East, India, Africa
US	Americas & Pacific Rim (Japan, Korea, China, Philippines, AUS, NZ)

Technical Support

If you should have a problem with a SBS product: Free technical support is available by phone, fax or email. Telephone support is available during the hours indicated at main locations or at the regional center where the product was bought..

EU	US
Monday through Thursday 8:00 – 17:00 (CET) Friday 8:00 – 16:00 (CET) Phone +49-821-5034-170 Fax +49-821-5034-119 E-Mail Aug-support@sbs.com	Monday through Friday 8:30 AM – 5:30 PM (Eastern Time) Phone +1-505-875-0600 Fax +1-505-875-0400 E-Mail support.government@sbs.com

Support on the Web

For support and information, visit our website at
http://www.sbs.com

Information for components, corresponding driver software, etc. can also be found at the following locations:

AMD Corp.	www.amd.com
American Megatrends	www.ami.com
Fedora	www.fedora.redhat.com
IBM Corp.	www.ibm.com
Intel Corp.	www.intel.com
Linear Technology	www.linear-tech.com
Microsoft Corp.	www.microsoft.com
Freescale Corp.	www.freescale.com
Novell	www.novell.com
NVIDIA	www.nvidia.com
PCI Industrial Computer Manufacturing Group	www.picmg.org
PLX Technology	www.plxtech.com
QNX Software Systems	www.qnx.com
Red Hat	www.redhat.com
Smybios Logic	www.lsilogic.com
VITA	www.vita.com
Wind River Systems	www.windriver.com

Warranty

SBS Technologies' products come with a 'return-to-factory' warranty which covers defects in materials and workmanship for a period of **two years in the case of board-level products and one year in the case of system-level products** from the date of product shipment to the customer (original purchaser), provided the product is unmodified and has been subject to normal and proper use.

For details refer to the 'Terms and Conditions' of your purchase contract.

Repairs

Warranty Repairs

Any product returned and found to be under warranty will be repaired or replaced at the discretion of SBS. The return shipping freight is paid by SBS.

Non-Warranty Repairs

If a product is found not to be under warranty, SBS will:

- Repair the product without notice of the customer when the cost is below Euro/US$250.
- Notify the customer of the non-warranty situation and provide a cost estimate to the customer, if the cost of the repair is equal to or greater than Euro/US$250. Non-warranty repairs above Euro/US$250 generally require that a purchase order be issued to SBS Technologies for the amount of the repair before repairs are undertaken.

The customer in addition to repair cost pays the shipping freight.

Procedure

In the event of repair, please return the product together with additional information. Please use the error report at the end of this manual and fill in:

- Description of the type of defect.
- Is the defect restricted to certain environmental conditions?
- What was the hardware environment before the defect appeared?
- Where there input signals? If yes, which?
- Please specify ‘warranty’ or ‘no warranty’ repair.

You may use the report form at the end of this manual for this purpose.

Please use the original packing material for shipping to avoid damage. Otherwise warranty may be lost.

To expedite assistance for problems, also provide the following:

- Your Name, Phone and Company.
- Product with which you are having trouble.
- Serial Number, Part Number and Revision.
- Hardware environment the product is used.
- Operating system you are running.
- Detailed description of your problem and any error messages that have appeared on the screen.
- The name of a technically qualified individual at your company familiar with the product failure.

Depending on the circumstances of the problem, it may be deemed necessary to return the product to SBS Technologies for repair. In order to return the product for repair, the following steps are necessary:

- Obtain a Return Material Authorization number (RMA#) from SBS Customer Support.
- Ship the product prepaid to the designated repair point.
- Provide a written description of the claimed defect with the product.

Obtaining an RMA Number

To obtain a product Return Material Authorization number (RMA#), you should call our Customer Service department through our main number.

Shipping the Product

Any product returned to SBS should be in its original shipping carton if possible. Otherwise the product should be carefully packed in a conductive (ESD) packing material and placed in a cushioned corrugated carton suitable for shipping.

Please mark the shipping label with the RMA number and return it to:

EU	**US**
SBS Technologies GmbH & Co. KG RMA# (*put RMA here*) Memminger Strasse 14 86159 Augsburg Germany	Customer Service Dept. ATTN: RMA# (*put RMA here*) SBS Technologies, Inc. 7401 Snaproll St., NE Albuquerque, NM 87109 U.S.A.

Note:
Returns in the US and associated regions should be sent to the office where products were bought. See separate address list of office, support and RMA addresses.

	Support addresses	
Albuquerque, USA (Corporate)	SBS Technologies Inc. 7401 Snaproll St., NE Albuquerque, NM 87109 U.S.A.	Phone: +1-505-875-0600 Fax: +1-505-875-0400 Email: sbssales@sbs.com
Augsburg, D	SBS Technologies GmbH & Co. KG Memminger Str. 14 86159 Augsburg Germany	Phone: +49-821-5034-170 Fax: +49-821-5034-119 Email: aug-support@sbs.com
Mansfield, USA	SBS Technologies Inc. 603 West Street Mansfield, MA 02048 USA	Phone: +1-508-261-7007 Fax: +1-508-261-1420 Email: sales.communications@sbs.com
Newark, USA	SBS Technologies Inc. 8371-C Central Avenue Newark, CA 94560 USA	Phone: +1-510-742-2500 Fax: +1-510-742-2501 Email: info.commercial@sbs.com
Raleigh, USA	SBS Technologies Inc. 6301 Chapel Hill Road Raleigh, NC 27607 USA	Phone: +1-919-851-1101 Fax: +1-919-851-2844 Email: sales.ec@sbs.com
Shenzhen, CN	SBS Technologies Room 501-502 Cyber Times Tower B Tianan Cyber Park Futian District Shenzhen 518041 P.R. China	Phone: +86-755-8347-5668 Fax: +86-755-8347-6535 Phone 800-830-9165 (China only) Email: china-sales@sbs.com Web: http://china.sbs.com
St. Paul, USA	SBS Technologies Inc. 1284 Corporate Center Drive St. Paul, MN 55121-1245 USA	Phone: +1-651-905-4700 Fax: +1-651-905-4701 Email: info.commercial@sbs.com
Waterloo, CDN	SBS Technologies Inc. 101 Randall Drive Waterloo, ON N2V 1C5 CDN	Phone: +1-519-880-8228 Fax: +1-519-880-8118 Email: support.fpga@sbs.com

Error Report Form

When you are returning a product for repair, it is very important to include a written report which details the nature of the problem in order to expedite the repair. Please always use the Error Report Form attached at the end of this manual or include the following information:

- RMA Number, if applicable
- Product & Serial Number
- Part Number
- Version
- BIOS built date [a]
- Contact: Name & Phone Number
- Detailed Description of the Problem/Defect

[a] The BIOS built date can be found on the BIOS boot up summary. Please get into BIOS SETUP and deselect the quick boot option in the BOOT menu.

Example/coding of the ID line:

62 –	0102 –	004199 –	00101111 –	071595 -	E7501 –	VR9 -	Y2KC-0
							year 2000 compliant
						project ID	
					chip set		
				AMIBIOS core copyright date			
			BIOS features				
		supplier ID					
	major & minor BIOS revisions						
processor, flash ROM size							

You can stop the video output for proper reading the three information lines as described: Simply press the “0 / Enter” key during the start-up sequence. This key is located on the numeric keypad of your keyboard.

Error Report Form (EU)

SBS Technologies GmbH & Co. KG	Company Name
Memminger Str. 14	Department
86159 Augsburg	Contact Person
Germany	Mailing Address
Phone Number +49 821 5034-170	Phone Number
Fax Number +49 821 5034-119	Fax Number
RMA# _____	Email Address

Part. No. _____ Version __ . __ Date __ __ __ Serial No. _____

Error Description:

Hardware Environment:

Operating System/Software:

Warranty repair: ❑ YES ❑ NO (Please see section 'Warranty')

Error Report Form (US)

SBS Technologies, Inc.	Company Name
	Department
	Contact Person
	Mailing Address
Phone Number +	Phone Number
Fax Number +	Fax Number
RMA# _____	Email Address
Part. No. _____ Version __ . __ Date __ __ __ Serial No. _____	
Error Description:	
Hardware Environment:	
Operating System/Software:	
Warranty repair: ❑ YES ❑ NO	(Please see section 'Warranty')